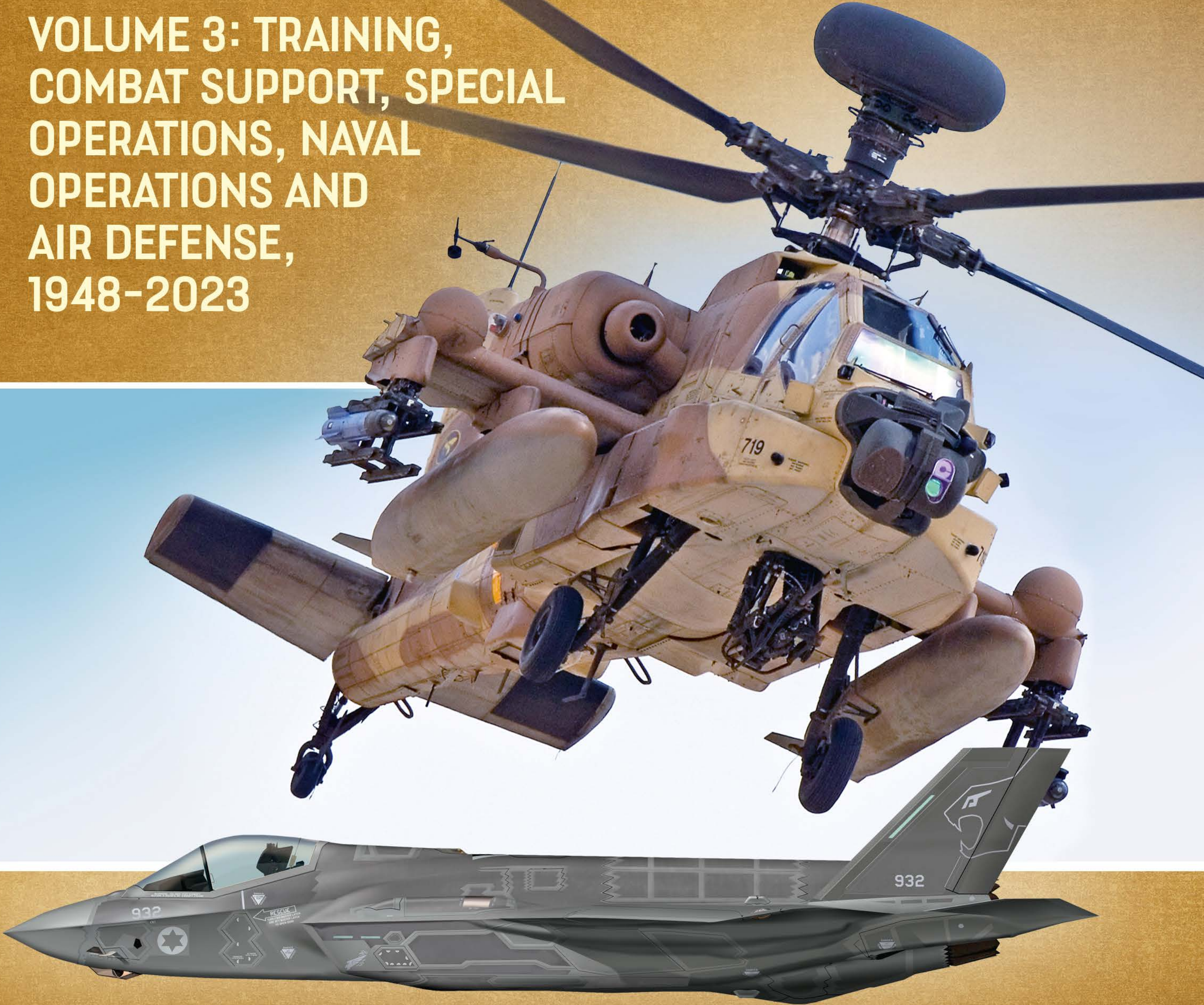
MIDDLE EAST@WAR No.36

FULL COLOUR THROUGHOUT

75 YEARS OF THE ISRAELI AIR FORCE

VOLUME 3: TRAINING, COMBAT SUPPORT, SPECIAL OPERATIONS, NAVAL OPERATIONS AND AIR DEFENSE, 1948–2023



MIDDLE EAST@WAR SERIES

Bill Norton

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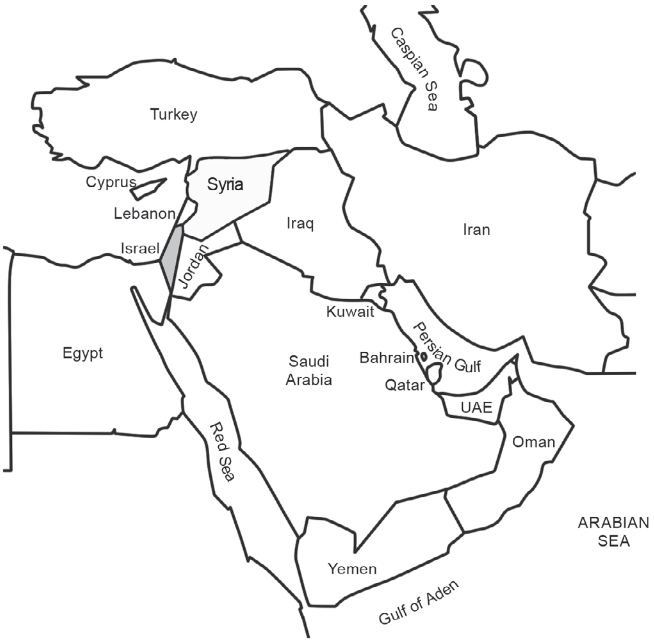

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Published by Helion & Company 2021
Designed and typeset by Farr out Publications, Wokingham, Berkshire
Cover designed by Paul Hewitt, Battlefield Design (www.battlefield-design.co.uk)

Text © Bill Norton 2021
Photographs © as individually credited
Colour profiles ©Tom Cooper and David Bocquelet 2021

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ISBN 978-1-915113-51-1

British Library Cataloguing-in-Publication Data.
A catalogue record for this book is available from the British Library.

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Acronyms and Abbreviations

AAA	anti-aircraft artillery
AAM	air-to-air missile
AB	Air Base
ADF	Air Defense Forces
AEU	Aeromedical Evacuation Unit
AEW	Airborne Early Warning
AFTS	Advanced Flying Training School
AHQ	Air Force Headquarters
AOP	Air Observation Post
AOTU	Advanced Operational Training Unit
AR	aerial refueling
ATC	Advanced Training Center, Air Transport Command
ATS	Advanced Training Stage, Advanced Training Squadron
C^2	Command and Control
C^3	Command, Control, and Communications
cm	centimeter, centimeters
COMINT	Communications Intelligence
CSAR	combat search and rescue
EAF	Egyptian Air Force
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
ELINT	Electronic Intelligence
EO	electro-optical
EW	electronic warfare
FLIR	Forward-Looking Infrared
IAF	Israeli Air Force, Israel Air Force
IAI	Israel Aircraft Industries, Israel Aerospace Industries
IASF	Israel Air and Space Force
IDF	Israel Defense Forces
IN	Israeli Navy, Israel Navy
INS	Israel Navy Ship
IR	infrared
IrAF	Iraqi Air Force
ISR	intelligence, surveillance, and reconnaissance
intel	intelligence
kg	kilogram, kilograms
km	kilometer, kilometers
l	liter, liters
LAF	Lebanon Air Force
lb	pound, pounds
LOROP	Long Range Oblique Photography
LZ	landing zone
m	meter, meters
mm	millimeter, millimeters
MoD	Ministry of Defense
NK	North Korea
NVG	Night Vision Goggles
OCC	Operational Conversion Course
OCU	Operational Conversion Unit
OTU	Operational Training Unit
PR	photo reconnaissance
RAF	Royal Air Force
REAF	Royal Egyptian Air Force
recce	reconnaissance
RJAF	Royal Jordanian Air Force
RPV	Remotely Piloted Vehicle
SAM	Surface-to-Air Missile
SAR	search and rescue
SIGINT	Signals Intelligence
Sov	Soviet, Union of Soviet Socialist Republics
specops	special operations
SyAAF	Syrian Arab Air Force
UAV	Unmanned Air Vehicle
UK	United Kingdom
US, USA	United States of America
USAF	United States Air Force
USS	United States Ship

Preface

May 2023 marks the 75th anniversary of the founding of the State of Israel and its air force. The maturation of the Israeli Air Force (IAF, Israel Air and Space Force or IASF from 2005) during its 75 years is a fascinating study of a relatively small military force working to meet shifting obligations under multiple impediments while being repeatedly tested in combat. Many factors over the decades shaped the air fighting capability, not the least being the demands of the evolving battlefield, uncertain funding, available weapons, and quality of personnel. Tactics and doctrine were, in turn, shaped by government policies, international pressures, and confronting adversaries likewise evolving. When the trials in war or combat short of war came, success was a measure in relevance of the service's weapons, adequacy of training, and experience of personnel.

The three volumes in this series documents this evolution of the Air Force throughout its history by examination of all of these factors. It stands apart from many other books in performing this examination in a more dispassionate and critical manner, without the common hyperbole. A good deal of space is devoted to describing the shifts in the force's aircraft and other weapons over time. An air force is structured to match its capabilities as defined by its aircraft and associated tactics, and so that structure is examined as well. Accounts of the service's combat operations then show the effectiveness of all the equipment and preparation. A summary of the geopolitical milieu in which Israel and its military institutions dwelled over the 75 years helps to understand the materiel acquisition and tactical choices while placing in context the operations in which they were employed. These volumes are written at a time of historical changes for the air force, and the Israel Defense Forces (IDF or "Zahal") as a whole, and so informs understanding of the service emerging and operating in future years.

These books leverage off of my volume *Air War on the Edge, A History of the Israel Air Force and its Aircraft since 1947* (Midland Publishing, 2004), but with a different focus and, of course, updated. Backed by official and unofficial histories published since, and the unprecedented openness in the past few decades (yet filtered through the military censor), I have worked to make this account more accurate and complete than those of the past, albeit restricted by limited size of the volumes. It is additionally constrained by the inability to conduct conventional research, confirming information via multiple official sources, because of security restrictions and foreign national access limitations. Consequently, errors may have crept in and disinformation unwittingly repeated. Place names and the names of persons are those most commonly referenced, as are Hebrew translations. (For example, "Israel Air Force" and "Israeli Air Force" are both found alternatively throughout officially translated literature and signage.) Written for the distant future reader, past tense is employed throughout these books.

I thank all those who assisted with research material, additional information and confirmation of facts, and providing photographs. I am also grateful to all those Israeli authors who labored so hard and for so long to record the history of the IAF/IASF in open literature via original research from which this interloper could mine in the writing of this book. A special thanks to my friend Ra'anan Weiss who was the inspiration for these books and their format.

Those readers who would care to comment on these and my other publications, or offer additional research material and photographs, may contact me at williamnorton@earthlink.net.

Bill Norton
Tehachapi, California, 2021

Introduction

The Israeli Air Force grew from humble beginnings to one of the largest and most experienced in the world. This came through several major and minor wars with its Arab neighbors, almost continuous military actions short of war, and preparation for power-projection operations unusual for so small a nation. The materiel and experience growth across 75 years is presented in the first two volumes of this series. This final volume details several important aspects of this history. It helps to explain how the IAF/IASF came to be such a significant element of Israeli defense and earn the respect of other air power teams.

Especially after the resounding success of the IAF in the June 1967 Six-Day War, experts wondered how the Israelis trained its aircrew. Even after that time, this was of interest given Israel's comparatively small budgets and inability to frequently shift its equipment mix. Adapting older equipment to new circumstances was always a hallmark of the IDF. In the last quarter century, the Air Force felt great budget pressures and moved to realize savings through a select fleet of training aircraft and simulators.

Intelligence was always important for the IAF to ensure its few resources and training were focused in responding to adversary equipment, disposition, and intentions. Photo reconnaissance was a vital element in this, and the service applied its usual combination of adapted materiel and daring in meeting these obligations. Likewise, extending the range and endurance of its comparatively small combat fleet via aerial refueling was long a goal. This was satisfied over many years via some foreign assistance plus local efforts in maturing capabilities and developing indigenous equipment. Similarly, electronic warfare (EW) capabilities had to be grown from modest systems to world class capabilities via in-country innovation augmented with foreign equipment. These systems assist in protecting the valuable air elements while lending offensive means as well.

The IDF has always relied upon special forces in responding to irregular warfare that has been common on its borders throughout its existence and given its heavy reliance on a reservist structure with a modest standing army. The Air Force has supported these operations in various ways from the earliest days, and special forces eventually became elements of the IAF/IASF itself. Separate Army and Navy air arms were unaffordable and unnecessary. The Air Force supported the Israel Navy's missions over the decades to include sea patrol and attacks on shipping. Dedicated patrol aircraft and shipboard rotorcraft were operated by the IAF/IASF under direction of the Navy. The Air Force always insisted that its aircraft were the nation's best defense, but a ground-based air defense force was an element of the IDF from its earliest existence. This came under direct IAF control when sophisticated radar-directed guns and missiles augmented the team. The air defense forces grew ever more capable in responding to missile threats such that its role gained greater importance and respect.

Insight into all these aspects of the Israeli Air and Space Force, matured throughout its 75-year existence, help to understand its capabilities and operations in the future.

1

FLIGHT TRAINING

During the War of Independence, Israel worked to train locals as pilots, sending them abroad initially and then attempting to perform advanced training at home. This included women, two of whom served during the war. As the situation improved in late 1948, the Israeli Air Force began instructing its first primary students at St. Jean Air Base (AB) using eight Piper Cubs, and then advanced instruction on eight Harvards. The Cub was a stopgap awaiting surplus Stearman, but these came very slowly because maintenance resources were overwhelmed. St. Jean's accommodations were poor and instruction was repeatedly interrupted by the war.

The foreign volunteers (Mahal) were vital in setting in place the initial training organization, curriculum, and instructional materials. After the war, their departure created a dramatic drain of experienced personnel. The flight instructor shortage was remedied by sending groups of pilots to Britain during 1949 for instructor training. These men returned to train others. However, the IAF continued to employ foreigners under contract for a time longer. That the few instructors spoke primarily English and cadets Hebrew created some difficulties. The first "wings" were awarded in March 1949 and again in May, though the situation remained precarious into summer. The goal of 100 airmen per year would not be met under the circumstances.

The Flying School was opened at Kfar Sirkin AB on the first day of 1950. The initial course was advanced training for pilots instructed during the war, graduating in July. The first full course passed out new pilots and officers that December. The school relocated to Tel Nof AB in 1955 after Sirkin was closed for economic reasons. Through 1957, it averaged 10 to 12 graduates every six months.

The Stearman served for many years as the primary trainer. This photograph from Kfar Sirkin on February 14, 1950, also shows an Anson in the background and a Harvard in the foreground. Efforts to replace the biplane always fell short. They disappeared only as the jet Fouga Magister came into the fleet in 1962. Those depicted here have adopted silver dope and yellow bands as training colors, reflective of their reduced combat potential. (BIAF – Israel Aerospace Magazine)

The Harvard was a mainstay of IAF flight training for over 20 years, though also performing general liaison and air base "hack" duties. Numbers were refreshed occasionally to replace loses and adopt airframes with greater remaining airframe life, with approximately 80 of various models collected. Those from France were overall yellow like this example, and the color was retained to denote training. (Shlomo Aloni Collection)

Due to the small size of the force and its lean resources, field squadrons undertook advanced training of new aircrew, conversion to combat types, and introduction to tactics using front-line fleet aircraft as Operational Training Units (OTU) and Operational Conversion Courses (OCC). This practice would persist throughout the IAF's history. Even the dedicated training aircraft had ancillary operational roles in an emergency throughout the first 50 years of the force's existence.

The training of pilots in the mid-1950s began with a 60-hour Primary Stage on Stearmans before moving to Basic on Harvards for 160 hours.[1] An Advanced Stage on Harvards was added in 1953 to acquire fundamental combat skills with night flying and low-level navigation. More of these surplus machines were acquired over the years to sustain the fleet. Although Israel bought Fokker S.11 light-planes with side-by-side seating for Primary, they were quickly found unsuitable and the biplanes soldiered on. Since the focus of the School at the time was to produce fighter pilots filling the undermanned combat squadrons, graduates were granted wings and then flowed to the OTU, initially on Spitfires and then Mustangs. Experienced aircrew were sent aboard for introductory training on new aircraft purchased from foreign governments, returning to set up like courses at home.

Only those students found unsuitable for fighters were directed to other aircraft. The Flying School operated some Ansons and Consuls for multiengine, instrument, and radio operator instruction. Transport pilots performed Basic in the Consul. Navigator training employed the Anson fitted with extra direction-finding equipment and astrodomes for taking celestial fixes. When the Ansons were withdrawn, Harvards were employed after modification with a third seat and direction-finding antenna. The role was assumed by C-47s by 1956. These Dakotas were modified with navigator stations in the cabin and additional

Seeking to replace the Stearman, the Fokker S.11 was procured in the early 1950s as more economical and offering side-by-side instruction. However, the aircraft struggled in the high temperatures of the Middle East, possessed maintenance annoyances among other issues, plus Israeli care for the machines was wanting. It had a short service and the Stearman carried on. (Author's Collection)

This C-47 has been modified with additional astrodomes and ADF antennae on the top centerline, as well as a mount for a radar pod under the nose. These features supported navigator training, though the radar also permitted the aircraft to conduct sea patrols. (Author's Collection)

electronic navigation equipment such as automatic direction-finders and astrodomes. The few Dakotas with radar pods added under the nose for sea patrol also served to train night-fighter radar intercept officers before obsolete Meteor NF.13s took over the role.

The 100 Squadron trained pilots separately to fly light-planes and light helicopters – though rotorcraft instruction was often conducted abroad. The students became sergeants upon graduation. They also wore unique light aircraft wings. Other sources of aircrew were the aero clubs across the country. Private pilots who qualified were given pilot wings with a red background. After logging 50 hours flight time with 100 Squadron, they were given light aircraft wings. All of the squadron's aircrew went through a course in patrol and liaison flying. They were only required to serve five years versus the normal seven. These unique practices persisted until the mid-1970s.

The *Gadna Avir* youth program was formed in 1951 for aviation introduction, recruitment, and selection. The Israel Aero Club, under IAF Flying School supervision, operated an advanced course with elementary flight training on gliders. Slingsby gliders, some built in Israel by Bedek Aviation, supported this effort. During the early 1950s, the more promising cadets got short experience flights in Cubs or S.11s.[2] After 1980, the program included use of civilian gliders and microlight aircraft.[3]

When the IAF became an all-jet combat force after 1956, cadets passed through an Advanced Training Stage (ATS) on Meteors before gaining their wings. This consisted of 50 to 60 hours, including 10 at night, and additional T.7s were acquired for the duty.[4] Operational Conversion Unit (OCU) training was then on Ouragans. This transition found ultimate expression when the Fouga Magister was introduced as the Basic Stage mount in 1962.

The school moved to the new Hatzerim AB in 1966, and the curriculum continued to evolve with the new trainers. Cubs served to screen cadets in a Pre-training Stage of three-weeks and 10 flights of about 7.5 to 10 hours.[5] Fundamentals were taught while the cadet's aptitude for instruction and acclimation to flight were evaluated. After a Training Stage that consisted of "boot camp," flight instruction resumed with the Magister. This began with the Primary Stage leading up to solo and aerobatics. It started with eight hours or nine flights providing data to divide students between those following fast jet, transport, or helicopter tracks.[6] The Basic Stage, for those going on to fighters, included 56 dual and 30 solo flights in the Magister.[7] This was made up of advanced aerobatics, emergency procedures, navigation, instrument,

This image from 1962 records flight course participants in front of 117 Squadron Meteor T.7s at Ramat David AB. This is probably the Advanced Training Stage just prior to graduation and awarding of wings. The appearance of the apron, aircraft, and aircrew with their personal equipment, could be mistaken as from for any western air force of the period. (Ra'anan Weiss Collection)

The Fouga Magister was one of the most fortuitous acquisitions of the French equipment era. The first jet trainer in the world, it came just as the IAF sought to grow beyond the T-6 shown in the background of this image, and the Fouga remained for half a century. This photo from about 1964 shows the early tri-colors plus training yellow nose and tail. The tip tanks, not visible in this photograph, were also in training yellow. (Ra'anan Weiss Collection)

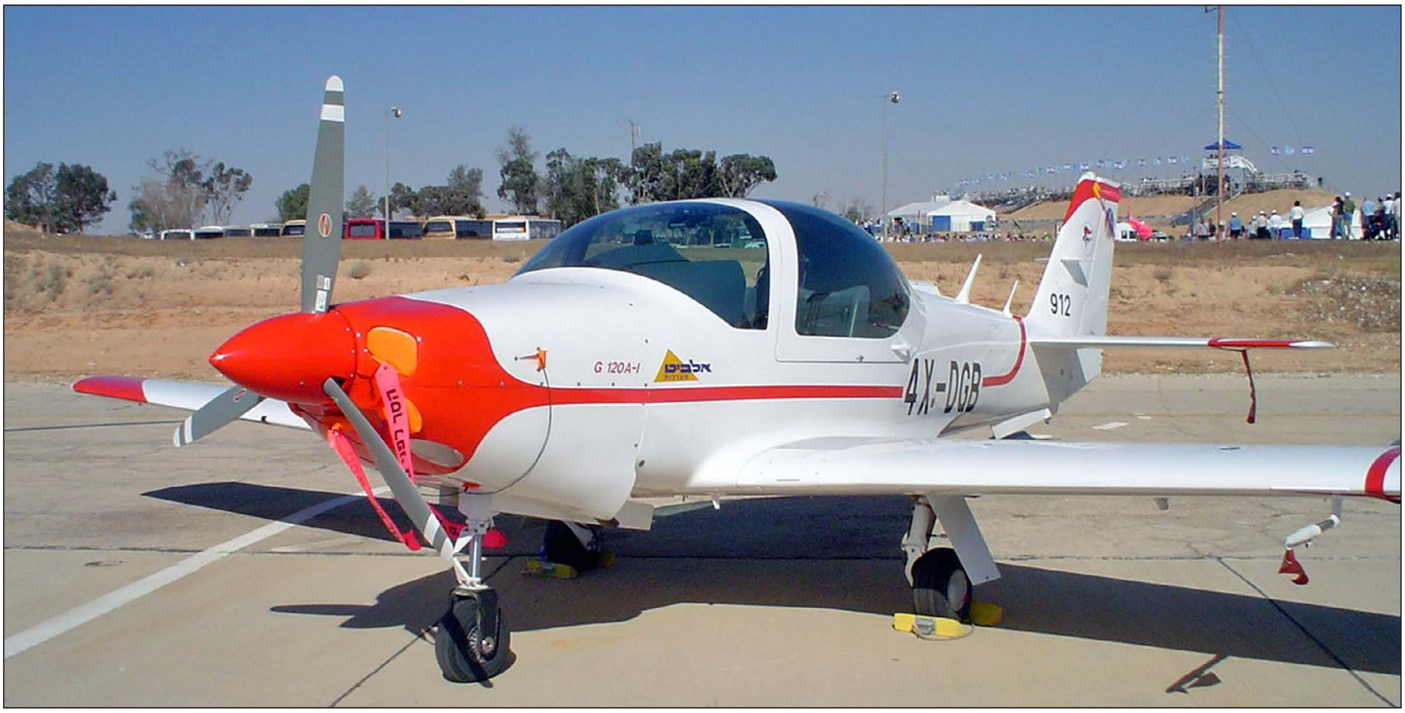
formation, and night flying. Senior Basic was officer training. Then came the Advanced Stage where fundamental air combat tactics were taught with 60 hours and 80 flights in the Magister. During the three stages in Fougas, the students logged 200 hours, reduced to 150 in later years. Pilots were then graduated after two years of training and sent on to the OTUs. Prospective flight instructors had two weeks in the classroom then a 40-sortie syllabus.[8]

The IAF had considered acquiring the Folland Gnat trainer to provide a transition between the Magister and the swept wing Mystère fighters. However, the quality of training permitted with the Fouga made this unnecessary and saved money. There was also consideration to accelerate the course to meet high pilot demand in the few years following the Six-Day War. However, leadership chose to stay the course to ensure quality.

Over the next four decades, the training scheme changed little. By the 1990s all Cub instructors were civilians retained under contract (although almost certainly former Air Force pilots), and the aircraft likewise maintained. Meteors lingered on in an Advanced Flying Training School (AFTS) after 1962 to provide the weapons training for which the Magister was not equipped. The 113 Squadron soon took on the ancillary mission with its Ouragans. With the activity renamed the Advanced Training Squadron (ATS), TA-4s assumed the task in 1972, but as the Advanced Stage of training. The four-month/70-hours period shifted between a School activity and an additional mission of 102 Squadron.[9] In 1990 this became the sole mission of 102 until 1994 when it resumed its combat role with advanced training as a major ancillary.[10]

In developing its own curriculum for air combat training, the IAF came to focus on a tactics manual prepared by Major Yaacov Nevo. Among Israel's first jet pilots, having trained in France and participated in some of the earliest jet combats with MiGs, Nevo's document contained some unique ideas. For years, he personally oversaw the "polishing" of new fighter pilots. Much was done in this way in the early IAF. Later, David Ivry and others augmented Nevo's manual. Nothing was presented from foreign sources without some modification to match Israeli circumstances. In later years, as more combat experience was gained, other officers contributed to the training of tactics that continued to evolve with the technology. Even for aircraft devoted to ground attack, 60 percent of training focused on air-to-air combat because it was felt such skills enhanced all other aspects of combat piloting.[11]

Transport pilot training continued to employ aircraft seconded from operational units. In the early 1970s, this used the tail-dragging Do.28 before the tricycle Queen Airs assumed the role in the 1980s. Such aircraft also served for navigation and communications systems instruction. The 122 Squadron contributed OTU with its Dakotas and Aravas.[12] This continued until 2001 when King Airs loaned from 100 Squadron assumed all these duties. The Hercules was used for advanced transport pilot and for navigation training. By the 1990s, there were no dedicated navigators or radio operators, but only back-seaters in fast jets (still called navigators). They all still got their spell in B200s. Navigators in aircraft like F-4s, F-15Is, F-16Is, and attack helicopters, were broken out from pilot training at some point for more intensive weapons and systems training until assigned to aircraft where specific conversion occurred at the squadron-level. Officers who had not completed the pilot course typically populated other aviation roles such as loadmaster, EW system operator, airspace control, and commanding a control tower team.



The elderly Piper Cub was finally retired and the Grob G 120 adopted for the introductory flight training role. This was a much more suitable platform for 21st century flight training. The depicted aircraft is notable in lacking military markings save for the Flying School badge on the tail. Like many non-combat aircraft, the machines were maintained and operated under a commercial contract. (Amos Dor Collection)

The establishment and growth of 124 helicopter squadron, and expectation of further rotorcraft fleet expansion, suggested that helicopter pilot training should be conducted in-country. Consequently, 13 used Bell 47s were procured in 1965 and the first instruction undertaken that year. After Primary on Fougas, the cadets went through a three-month helicopter Primary on the Bells, supported by 123 Squadron, before moving to 124 for advanced training and operational indoctrination.[13] As Super Frelons and then Sikorsky S-65s plus Hueys came into the service, and the IAF moved to an all-turbine helicopter force in the early 1970s, Alouettes were acquired from 1968 to take up training. The 125 at Sde Dov AB maintained a flight at Hatzerim for this purpose. The Bell 206 took over in 1975 and a Primary course of 10 flights divided those streamed to attack or assault airframes.[14] The Bells became contract resources in 2004 and gave up combat support missions.[15]

The School's rotary wing training expanded in the 1970s to include both Primary and Advanced instruction for both pilots and navigators. Instruction began with 10 flights in the 206 to assess student suitability. Bell 212s from 123 Squadron offered the transport pilot OTU, also training helicopter crew chiefs, while others at Hatzerim AB were for basic twin-engine helicopter pilot introduction. Advanced training emphasized low-altitude flight and night operations, as these had become vital skills by the 1980s. The 500MDs served at the Flying School by 1990 for the OCC to attack helicopters. That year the Defenders made up an Attack Helicopter Training School at Hatzerim.[16] In 1997, the Hughes machines were replaced with AH-1Es from 161 Squadron.[17] With retirement of the Cobras in 2014, the 206 had to imperfectly assume the role until 2021 when new Leonardo AW119Ks were to come into the force.[18] For the navigators, training eventually came to include low-level flight and use of night vision goggles. Students headed for assault machines were given Advanced on Bell 205s beginning in perhaps 1968 and then the 212 around 1978. The UH-60A, seconded from 123 Squadron, took up the role perhaps soon after 2000, as well as assault helicopter OTU. In 2017, all rotorcraft students trained on the UH-60, selection for attack and assault made following graduation.[19] The AW119K was expected to take over these duties as well. An attitude change also occurred after the mid-air collision of two CH-53s in 1997, along with many other accidents over the years. Students directed to rotorcraft would be selected as best suited rather than (perceived if not true) those judged unfit for fighters.

By 1980, the Magister's capabilities were growing dated, yet a suitable replacement could not be found. Consequently, the fleet underwent remanufacturing and modernization that added 5,000 hours to the airframe plus updated avionics and instruments. The 86 Tzukits were redelivered in the first half of the 1980s. A cockpit simulator was also developed in the early 1990s. Maintenance was taken over by Israel Aircraft Industries (IAI) in the mid-1990s.

By 2000, the school worked to graduate fighter pilots and navigators, attack and assault helicopter pilots, transport pilots, and flight engineers. The flight course ran two years with four six-month terms, a new course commencing every six months. The Preparatory Term included military training, academics, and flight screening. The latter was composed of 15 Cub flights with two instructors making the assessment. Basic included officer training and 10 Magister flights from which cadets were streamed to fighters, helicopters, or transports. Primary then completed the Magister training. A year of college was completed before cadets moved into the Advanced terms.

The Israeli military induction process provided the Air Force with high school graduate pilot candidates after passing written tests and personality assessments. From a pool of 1,200 candidates, a course typically began with 300 cadets of which perhaps a few dozen graduated. Graduates typically earned their wings at age 19. In the early years, new pilots were considered combat ready after 24 months of training. This resulted in a very youthful corps, with an average age of 23 years for those flying in the Six-Day War.[20] This was in contrast to Western air arms where pilots were usually required complete a four-year college degree program before entering training. After eight years of IDF service (up from five in the earliest years, then seven), all aircrew entered reserve status until age 45 (down from 55) if not continuing as career officers.[21]

After many years searching for a suitable replacement for the Magister, and searching for the requisite funds, the IASF settled on the Beechcraft T-6A Texan II. The choice, the same made by the USA military and permitting use of American aid money, marked a significant jump in efficient and affordable training. This line of aircraft under a Hatzerim AB shelter wear the Flight School badge and represent a goodly number of the 20 airplanes. (Israeli Air Force)

Entering the new century, the Israel Air and Space Force (IASF) sought to greatly reduce the cost of flight training with increased efficiency. Zahal inductees were more carefully screened and the curriculum adjusted with the goal of increasing the percentage completing flight school, and so training fewer personnel from the outset. Equipment changes required more than a decade as paced by funding. The Cub gave way to the Grob G 120 in 2002-2003 for more efficient screening and line abreast seating. The Magister was replaced with the T-6A in 2009-2010. The IASF had wanted a jet, but use of American aid dollars compelled choice of the turboprop. Yet, the reliability and low operating expenses were combined with modern cockpit displays to give a cost-effective substitute for nearly twice the number of Tzukits. A digital recording system was also added for debriefing students, and flight instruction was supplemented with simulators. Both the G 120s and T-6As were maintained under contract, and the Grob flown by hired pilots. The last of the IAF's Skyhawks, employed in ATS, were finally retired in 2016 as the M-346 was adopted along with simulators. Transport pilots and navigators continued to train on B200s.

These changes were emphasized with a name change in 2002 to the Israeli Air Force Academy and accompanied by a shift in the curriculum consisting of three years of six-month terms. Preparatory consisted of the Grob screening plus introductory military training. Basic had T-6 instruction and officer indoctrination. The Initial Term either continued T-6 instruction or the student moved to the Bell 206. A year of college was followed by the Advanced Term on the M-346 and AH-1s (later 206s, both maintained under contract) or UH-60.[22] Altogether, a cadet collected about 250 flight hours and 50 in simulators. Graduates then had a 20-year service commitment.

The IAF sought to streamline fighter pilot operational training as well. When the 102 Squadron's A-4s assumed the ATS role, they also became the OTU for the IAF's fighter community. From 1990, the F-16A/Bs performed an Advanced OTU (AOTU) transitioning pilots from third-generation fighters (A-4s, F-4s, and Kfirs) to "fourth-gen" (F-15s and F-16s). From 1999, those bound for F-16s were run through an OTU in that aircraft while those directed to F-15s remained with Skyhawks. As the force grew even more complex, this was no longer optimal. From 2003, all aspiring fighter pilots from ATS spent six months in the F-16A/B OTU and then six in AOTU, plus simulators. These Lead-In Fighter Trainers had instrumentation added to record the mission for post-flight debrief and critique. Pilots then moved to their permanent assignments where they gathered type-specific training and unique qualifications like flight instructor. Hence, it was more than four years for a fighter pilot to become combat-qualified. With retirement of the F-16A/Bs in 2016, the M-346 took-up all the fighter pilot training duties.

Honing combat skills requires realistic exercises. An Advanced Training Center (ATC) was created at Ovda AB in 2005 with 115 Squadron resurrected to serve as non-operational "Aggressors" or "Red Squadron" operating a flight of F-16As and of AH-1s contributed by 161 Squadron.[23] This was similar to the capabilities IAF pilots had encountered at Red Flag and Maple Flag in North America. Israeli industry also built telemetry pods to send data to a ground station so air battles could be monitored real-time and results replayed for critical review.[24] Onboard systems could also simulate enemy threats.[25] With retirement of both those types, 115 took up F-16Cs and Bell 206s (the latter until some hopeful replacement). Adversary SAM emitters or simulators were placed on the range.

Women were trained as pilots through the mid-1950s. There was a standing order that no women were to fly beyond the border, but an exception was made during the 1956 war for a C-47 copilot who participated in the Mitla airdrop. Israel soon prohibited women from serving in any combat role, and since all aircraft were then expected to have missions in harm's way during war, women inductees were no longer sent for flight training. In the mid-1970s two women were accepted for the course, but washed out, and the prohibition was reimplemented.[26] This was challenged in court during 1995 and the Ministry of Defense (MoD) consented, provided the cadets agreed to compete on equal terms with men and not to demand release from service for pregnancy (then the common practice). The first woman entered flight training in 1995 and the first to graduate was in 1998 (becoming an F-16D navigator). The first woman combat pilot won her wings in 2001. By 2017, women graduates filled all categories of aircrew duties and there was a woman deputy commander of 106 Squadron.[27] A woman transport pilot was commander of a flight services squadron. A flight squadron commander followed in 2020, heading 122 Squadron. The 2006 Lebanon war saw the first woman combat fatality since 1973 with a flight technician dying when her CH-53 was shot down.

Starting in 1950, a small cadre of flight instructors flew aerobatic displays in whatever was the current basic trainer. This grew to a more formal activity over the years. Shows were put on for Flying School graduations, Independence Day celebrations, Air Force Day, and a few other national events during each year. A rotorcraft aerobatic team also performed for a few years with JetRangers.

The Unmanned Air Vehicles (UAV) grew to such importance that the IAF fostered model airplane flying to grow future operators. It established a UAV School at Ein Shemer in 2004 (also a testing site) using systems such as the Scout that required remote control take-off and landing.[28] It eventually adopted a half-scale trainer named the Dror.[29] The six-month course moved to Palmachim AB in 2011, hosted by 200 Squadron.[30]

2

PHOTO RECONNAISSANCE

From its earliest days, the Israeli Air Force valued photo reconnaissance highly and maintained a robust photo reconnaissance (PR) capability that evolved with the technology. This allowed target planning and intelligence ("intel") collection on opposition assets, plus information gathering for national leadership decisions. The hundreds of missions were supported by radio relay aircraft that also monitored enemy communications, interceptors on standby, and rescue forces at the ready. Hence, the capability required considerable investment in unique equipment and great risk for airmen flying the sorties into hostile airspace. These were classified activities within just a few squadrons.

The pre-state Air Service took photographs from light-planes with common handheld cameras. A Spitfire assembled from Royal Air Force (RAF) scrap in 1948 had a fuselage configured for cameras, so it was turned to fast photography missions. On November 19, the aircraft was over Damascus making the IAF's first photo reconnaissance of a foreign capital. One or two S-199s were also adapted to the role. During the remainder of the war, the camera ships flew several sorties deep into enemy territory.

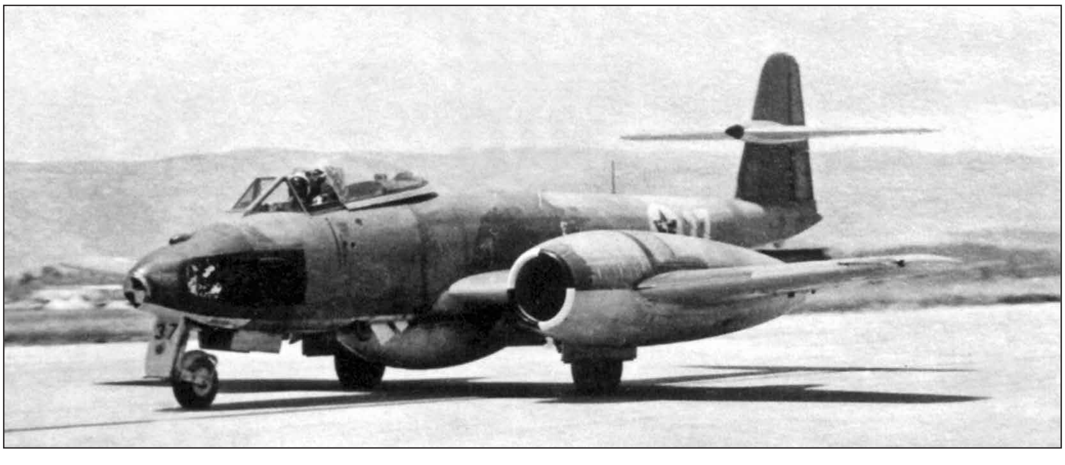
Following the war, some of the growing number of P-51s came fitted for cameras that included shooting out the side. Such oblique photography was important because national leadership felt at the time that overt use of airpower, such as cross-border recce missions for vertical imaging, was too provocative. Because oblique photography did not necessarily require an armed, fast platform, one or more C-47 Dakotas were converted for the role – probably with cameras aimed out the side cargo door opening. The Noratlas performed the same task, the troop door removed.[1] Later it appears at least one Noratlas was fitted with palletized camera equipment projecting out the open aft end of the fuselage with the cargo doors removed.

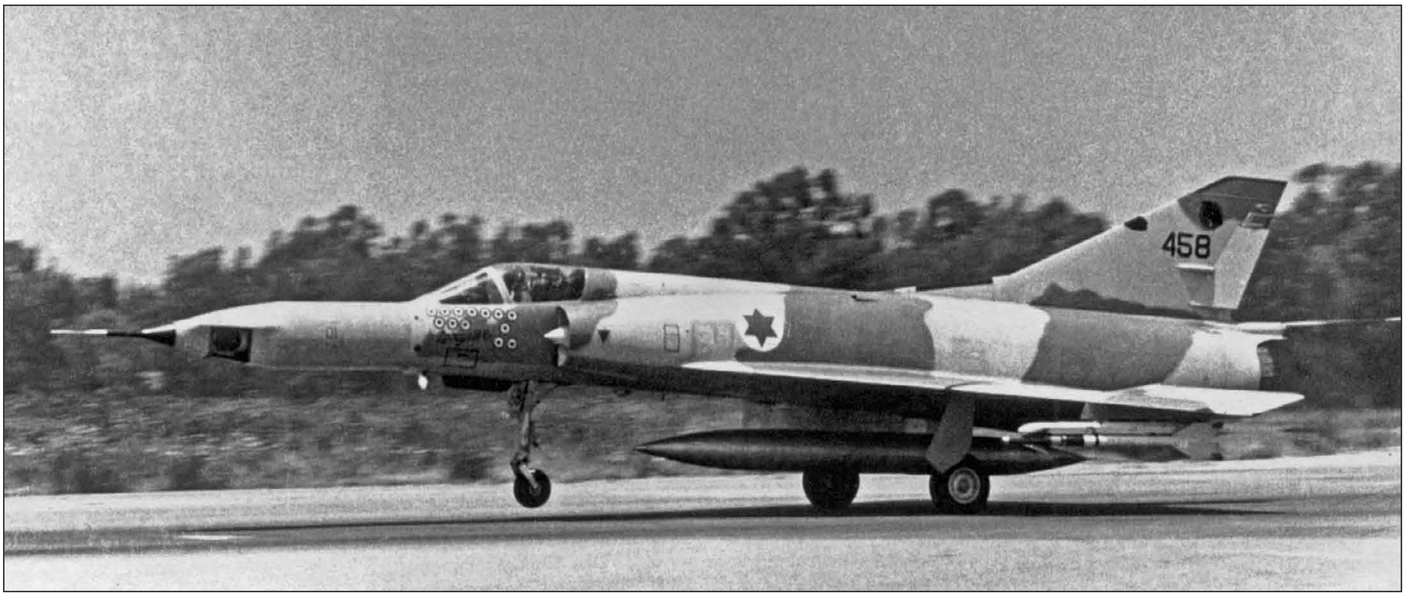
Among the secondhand Mosquitos acquired during the first half of the 1950s were PR.16s. The IAF retained a few of these in the long-range photo-recce configuration with external fuel tanks augmented with bomb bay fuel cells, cabin pressurization for high altitude work, and lightening by removal of nonessential equipment. This permitted up to five-hour missions as high as 30,000 feet (9,144 m). The first deep penetration over-flight was performed in 1953, and missions continued through 1956. Later in the decade, as the IAF entered the jet age, the Israelis converted a pair of Meteor FR-9s and two or three T.7s to PR.

The Mosquitos and Meteors did vital work in helping to map future battlefields and track the growing military power of the Arab states. They also began the collection of images to assist planning air base strikes that became a centerpiece of IAF training and war plans. The missions ranged as far afield as Upper Egypt, Libya, and Iraq. The countries overflown usually launched no intercepts, or these were ineffectual.

Acquisition of French warplanes in the mid-1950s brought new PR capabilities. A Mystère IVA with a camera installation was available by the time of the 1956 war. A second Mystère camera ship was acquired later, possibly via modification. Next, the twin-engine Vautour bomber fleet included four IIB models intended for photo reconnaissance to greatly boost range and speed for such missions. The camera-equipped Mystères became redundant and were altered back to pure fighter-bombers.

The Vautour IIBs arrived slowly and, in the meantime, some IIAs were modified with camera pallets in the bomb bay. The IIB delays were because the French had abandoned the BR variant and the Israelis had to contract with Sud-Ouest to perform the camera modifications. This permitted the IAF to select the cameras and their mounting angles – a combination of vertical and oblique. The cameras and additional fuel cells were in the bomb bay, though a camera could also be mounted in the "glass" nose. Onboard film processing permitted analysis very soon after landing. These


An IAF Meteor FR.9, probably photographed in the early 1960s, shows one of the camera windows in the nose. The Meteor camera ships took over from Mosquitos, but possessed less range despite the external tanks such as the belly slipper tank seen here. (Amos Dor Collection)



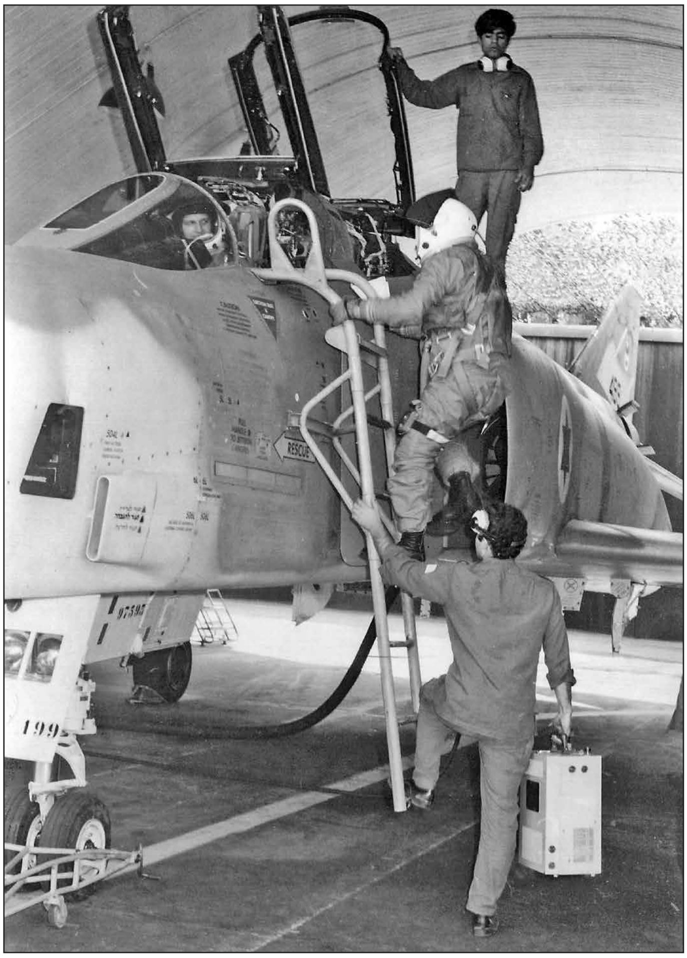
A unique camera nose adorns this 101 Squadron Mirage (unit badge obliterated by the Censor) as it lands and deploys its drag chute. The aircraft, image dating from the late 1970s, has the Atar 09C engine upgrade. The long camera nose, called Modesty (*Tsniut*), had a rotatable barrel assembly. Note the AIM-9 missile on the outboard launcher. (Author's Collection)

systems underwent alterations in-country over the years to meet evolving needs. As opposition air defenses improved, Vautour daylight reconnaissance grew excessively risky. Night sorties were substituted, the target illuminated by parachute flares once it was located. The Vautour IINs were also turned to the PR mission once its night-fighter role became redundant.

Two Mirage IIICJ(R) fast recce birds arrived in 1964. These permitted more survivable missions given the greater speed of the delta-wing fighter. Night photography was aided by locating the target via radar returns and then dropping flares. These were not the standard French camera ships but had interchangeable noses with various American cameras to suit specific missions. One had a revolving lens assembly to shoot at five angles. The Israelis further modified the aircraft, one having a camera placed in the gun bay and with added fuel. A mechanism at the end of the runway leveled the aircraft so that maximum fuel could be pumped aboard just before startup.[2] Before and after the IIICJ(R)s arrived, the Israelis modified three standard Mirages with camera noses, some of the work initially performed in France. The various noses underwent multiple changes over the years to meet evolving mission requirements and profiles.

Photo-recce took on greater significance in the first half of the 1960s as Israel collected detailed information on Arab airfields and air defenses in preparation for pre-emptive attack. The missions continued during the War of Attrition, some exceptionally hazardous. Sometimes two camera ships flew in formation to ensure the images were captured and to provide wingman support. As the Arab air defenses became more competent, fighter sorties in one area would distract defenses while the recce jet quickly executed its pass. A Vautour IIB on such a mission was downed by an SA-2 on December 1, 1967, demonstrating the growing surface-to-air-missile (SAM) threat. This prompted adoption of partial-pressure suits that year to permit very high altitude flights.[3] Nonetheless, one PR Mirage was brought down over Syria in 1974 by an SA-2 while flying Mach 2 at 80,000 feet (24,384 m).

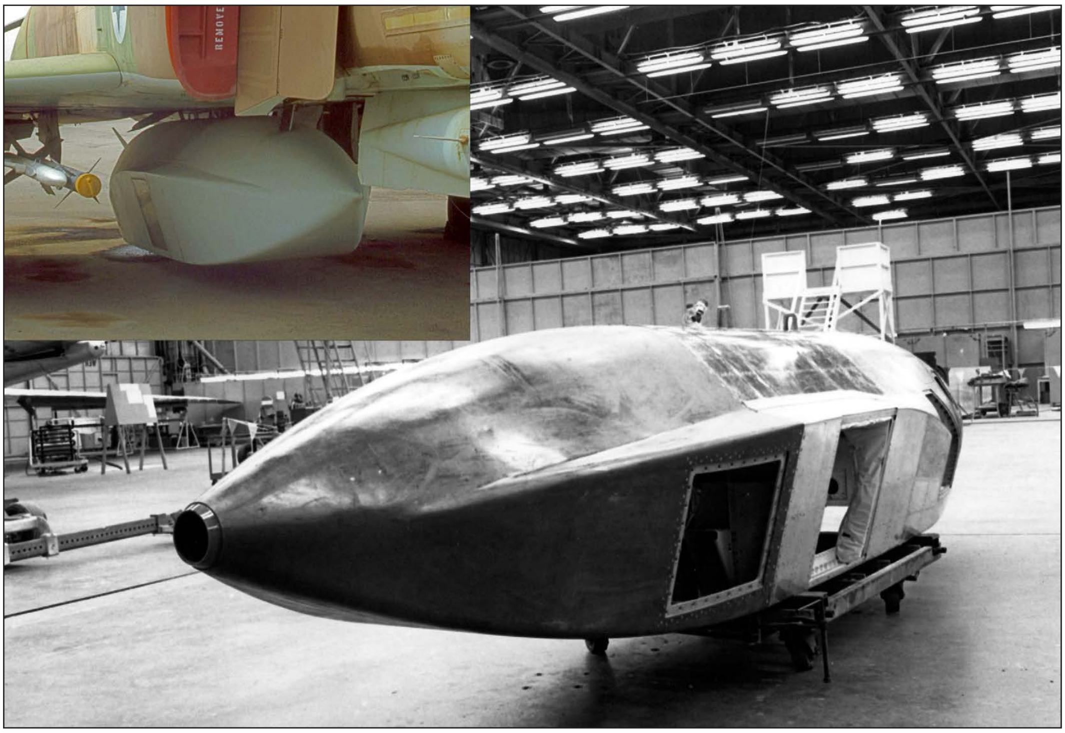
When the Israelis were finally permitted to purchase the Phantom, they lost no time in ordering six of the photo reconnaissance variant. While awaiting these machines, cameras were installed in place of the gun on two F-4Es in 1970 to meet urgent intelligence-gathering needs.[4] The IAF also borrowed two RF-4Cs from the United States Air Force (USAF) that year.[5]



An effort to evade the growing adversary air defenses, particularly SAMs, led the Israelis to fly so high as to require partial pressure suits. This began with the Mirages and continued into the Phantom era. Here a suitably garbed navigator boards 119 Squadron's RF-4E aircraft 499 – though the nose gear door bears the earlier code of 199. (Ofer Zidon Collection)

The RF-4Es began arriving in 1971 and, unlike the standard recce models, these were equipped to fire AIM-9s. Their radar and photo-flash flare cartridge dispensing systems bolstered night reconnaissance. These powerful jets carried a far more extensive and sophisticated suite of cameras than the Mirages. The USAF helped the Israelis set up a photo processing center.[6] The imagery was a great boon in the continuing struggle for quality intelligence information during and after the War of Attrition.

The "Photo Phantoms" proved their worth immediately, but the lack of timely intel was a costly hindrance to Zahal operations during the Yom Kippur War. At least to address the hardware end of the problem, six more RF-4Es were procured after the war. Over the years, the Phantoms' camera systems were modified and enhanced by the Israelis. It is known that four of the aircraft had their radar removed, five aperture windows installed in the radome, and another camera added. The RF-4s were also fitted for synthetic aperture radar mapping and with an IR linescan capability to augment the optical systems.



The Israelis were able to convince the Americans to sell one of their G-139 pods containing the large Long Range Oblique Photography camera with rotating lens assembly. The very heavy LOROP unit contributed to the enormous size and up to 4,000-lb weight of the pod carried on the centerline of the F-4. The pod is shown under assembly in the USA and the retired pod under a Phantom at the Israeli Air Force Museum. (Author and Jay Miller Collection)

The RF-4Es stepped into the tradition established by the Mirages and flew increasingly bold missions deep into opposition airspace. As these operations became more hazardous, with air battles sometimes resulting, multi-ship recce expanded with as many as four aircraft going after different objectives simultaneously as a means of getting the most "take" from the intrusion and swamping defenses. The crews also took on the partial-pressure suits and flew passes as high as 73,400 feet (22,372 m).[7]

The earliest missions for the RF-4s were to monitor the disposition of Egypt and Syria's formidable air defenses arrayed along the fronts. These defenses became so lethal by summer 1970 as to make recce penetrations extremely hazardous. Flights were conducted at 600 knots and at such a low altitude that the major hazards were bird strikes and fishing boat masts. It is believed that Israel ceased RF-4 flights across the Suez missile batteries that summer, and across the "Purple Line" on the Golan Heights in summer 1972. However, missions to image other areas of those countries were undertaken by skirting the SAM "belts." The Egyptians (plus Soviets) and Syrians became more and more aggressive in challenging these sorties – escorted partially or fully along their route – until each mission risked a major air battle. Consequently, airspace violations of surrounding states appear to have become rare after the 1970s, excepting Lebanon. However, even there, Syrian MiGs occasionally harassed recce flights over Lebanon until about 1985, sometimes resulting in engagements with protective fighter cover.

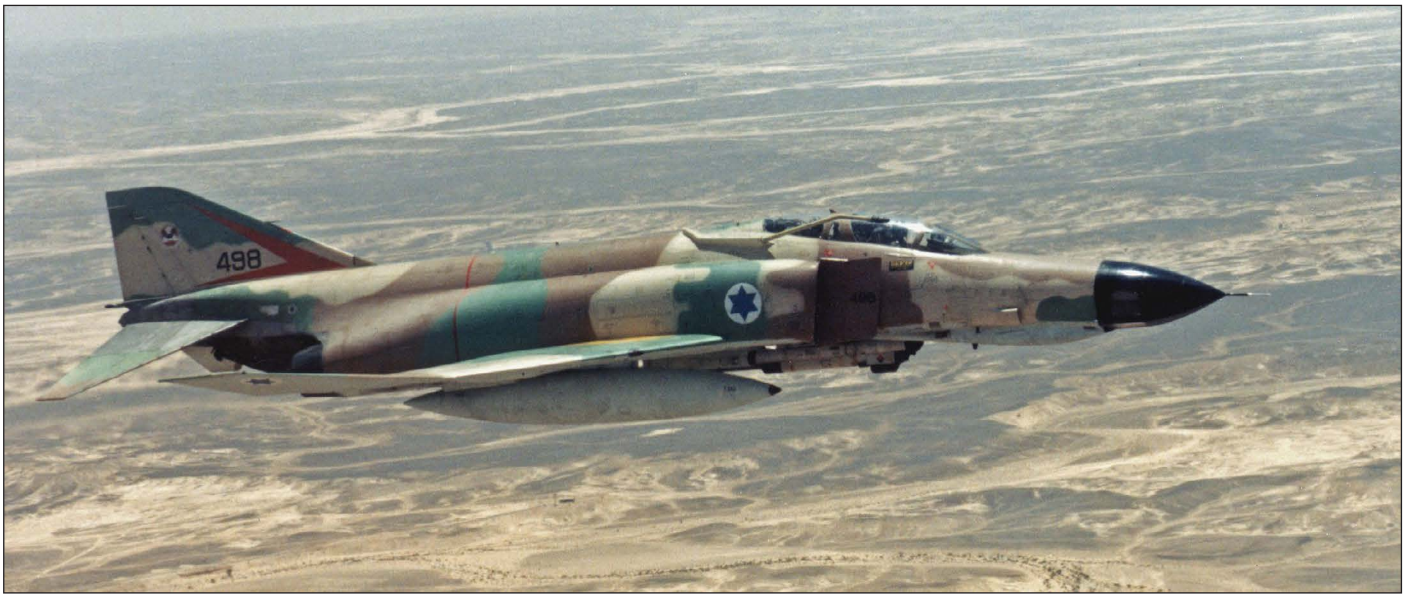
The IAF added post-strike cameras to the A-4s and F-4s to save the hazards of flying Bomb Damage Assessment missions over the targets. This was important in the Yom Kippur War where recce was so dangerous yet the intelligence so vital. The 119 Squadron flew 17 percent of its Phantom sorties as PR during that war.

Because of the SAMs, the oblique aerial photography tradition was reemphasized with two Stratofreighters modified to carry exceptionally large aerial cameras. One of these cameras, borrowed from the Americans, was a one-of-a-kind 6,500-lb (2,948-kg) unit of extraordinary capability and requiring a major modification to install that was performed in the USA. It served for about three years in the early 1970s before the camera was returned. The other converted KC-97G, flying a photo mission along the length of the Suez Canal, was brought down by a pair of SA-2 missiles in 1971. Clearly, a fast jet was needed even for oblique photography.

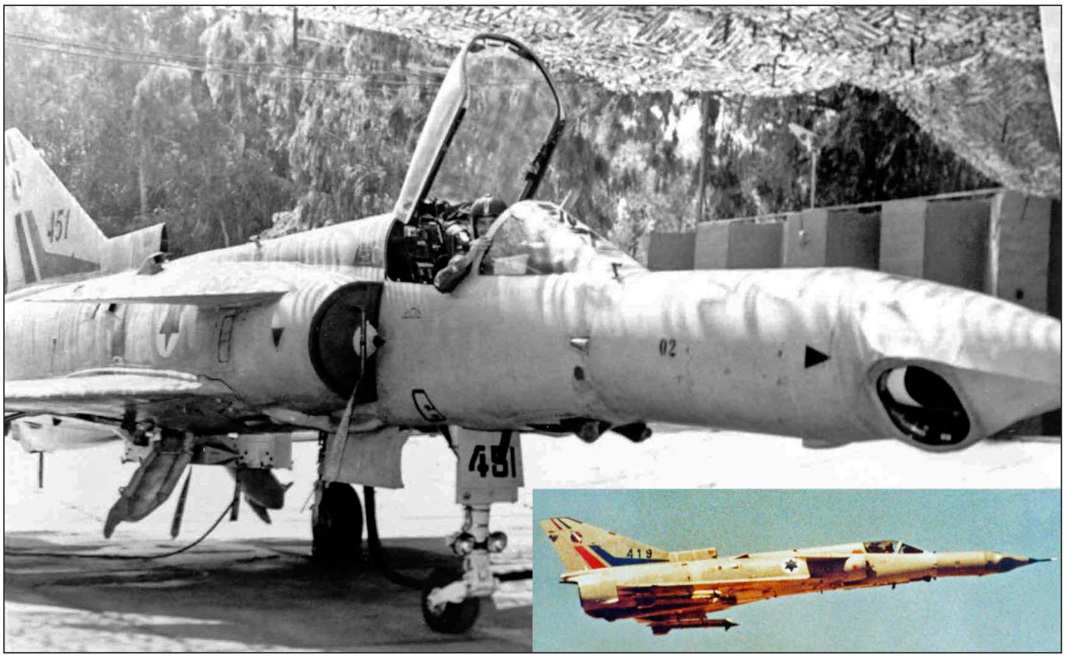
The Israelis had been for many years interested in the American's Long Range Oblique Photography (LOROP) camera, with rotating prism assembly for photography out either side. This remarkable, but exceptionally large and heavy camera could resolve a 10-inch (25-cm) object at 23-mile (37-km) range. After much delay, the USA finally sold the IAF the G-139 pod, weighing up to 4,000-lb (1,814-kg) and containing a 1,500-lb (680-kg) LOROP unit. Acquired during 1971, the Israelis carried the enormous pod on the centerline of RF-4s and on two specially modified F-4Es.

Since the enormous G-139 pod significantly impacted aircraft handling and performance, some manner of internal mount was desired. A joint program with the USAF was undertaken during the first half of the 1970s seeking to install a smaller LOROP in a Phantom airframe modified for enhanced performance as the F-4X. The performance features did not pan out, but the Israelis chose to continue the camera installation.[8] Three Phantoms were sent to the USA for the modification and returned in 1976 as F-4E(S)s. The LOROP camera was fitted inside the enlarged nose of the aircraft, displacing the radar and gun, and was among the first systems with electronic imaging data-linked to the ground.[9] The entire camera was rotated within the nose to view from any one of four windows – two on the bottom quadrant and two to the sides. The IAF also had a separate camera mounted vertically aft of the oblique unit.

The Phantom recce aircraft were extremely valuable, especially with the supporting electronic warfare systems that were installed over the years. Their missions were undertaken behind a deep



Seeking LOROP capabilities without the high drag of the G-139 pod, the Israelis worked with the USAF to modify three F-4s with a unique nose installation. Lacking radar and gun, the enlarged nose of these F-4E(S)s had windows permitting the rotating lens assembly to accommodate vertical as well as oblique photography. This example from 1997 displays the colors of 119 Squadron and carries an Electronic Countermeasures (ECM) pod. The nose was painted as if a radome to help conceal its special nature. (Ra'anan Weiss Collection)



Two Kfir C2s took up the delta-wing recce mission. These aircraft are shown with 149 Squadron markings probably in 1987, eight years before they were retired. Ship 419 carries AIM-9L missiles. Of the four camera noses the aircraft could be fitted with, the one depicted is the *Tsniut* unit possessing a rotating barrel assembly (ground adjustable only) for various viewing angles. The aircraft (previously with serials beginning with an 8) were retired. (Ofer Zidon Collection)

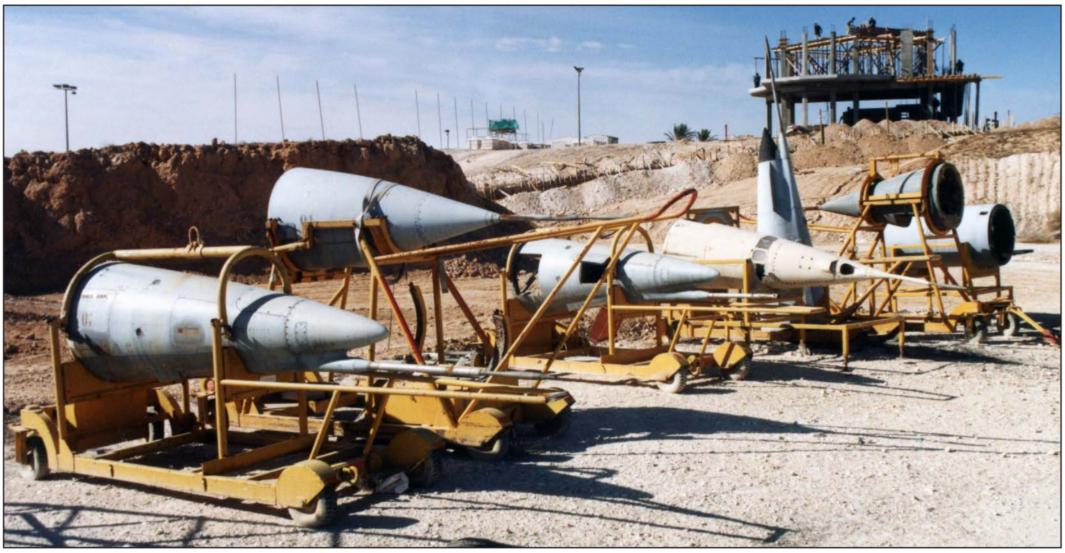
veil of secrecy. The sorties were much helped by the Israeli addition of an aerial refueling probe to their Phantoms for use with their homegrown tanker fleet. There were indications of infrequent flights over Iraq in preparation for the 1981 raid on the Osirak nuclear reactor. Later missions sought out ballistic missiles and chemical/biological warheads. Despite this dangerous line of work, only one of these assets were shot down on a recce sortie.

Other manned PR assets were two Kfir C2 aircraft converted to carry the variety of unique camera noses developed for the Mirages and with the advantages of inertial navigation. Some of these noses were exceptionally long and with a rotating barrel assembly (ground-adjustable only) for all-aspect imaging. These were retired in 1995 and the F-4s in 2004.[10]

Even as unmanned platforms began to evolve for recce missions, the manned camera ships retained their appeal for mission flexibility and speed. However, the Israelis followed the example of many Western air arms and chose to forego purpose-built PR jets for podded solutions. All that have come to light are of Israeli manufacture, though with some foreign content, and with digital datalinks to transmit images.

The Condor, operated since 1998, was based on the F-16 300-gallon centerline external fuel tank. It used a LOROP camera with a rotating prism assembly on the lens to allow various angles of view out the pod's wrap-around windows, offering horizon-to-horizon imaging. This was a programmable system for autonomous operation in visual light and infrared. A similar system, called Ofir, was based on the shape of an F-15 600-gallon centerline tank. F-15 photo recce began in 1983, but the RF-4s carried the pod as well from 1993. The October 4, 1991, reconnaissance of southwestern Iraq was reportedly conducted by a flight of F-15s that may have employed the Ofir or an earlier system. Optical targeting systems, such as the Litening pod, could also provide image intelligent. Akin to these, the Reccelite was carried on the "chin" of suitably equipped F-15s and F-16s for superior tactical imaging. A synthetic aperture radar pod, Gondola, was based on the F-16 tank.[11] This permitted ground moving target identification and imaging through clouds.

The burgeoning SAM threat in the 1970s was responsible for the IAF adopting unmanned PR systems. The collection of photo intelligence data on the SAM emplacements and status of deployed Egyptian and Syrian ground forces was imperative, regardless of



The family of camera noses for the IAF's delta-winged airplanes were eventually stored as that era passed, and then set out in the elements at the Museum. The various Mirage and Kfir noses reveal the many windows in some for the camera rotating lens or prism assemblies. (Author)

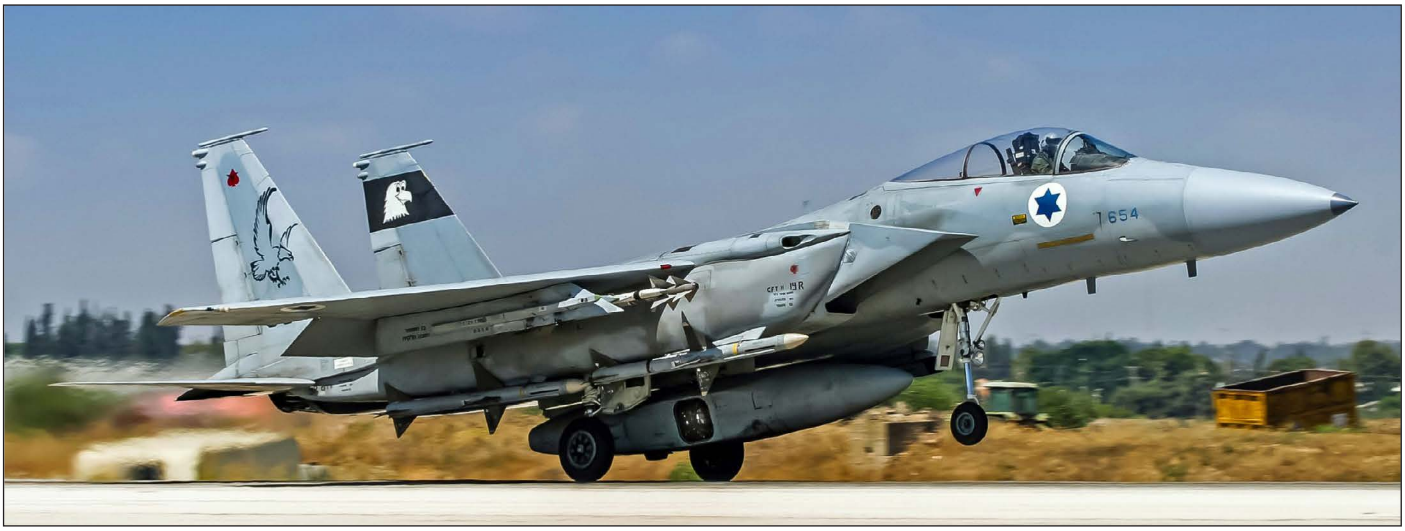
the grave threat to manned PR aircraft. The Americans went to great lengths to dissuade the Israelis from provoking the Egyptians into renewing hostilities along the Canal. This included allowing the Israelis to procure Firebee reconnaissance drones that had performed so well over North Vietnam. The Israelis received 12 custom-built Model 124Is in 1971. Optimized for low-altitude flight, the small jet had as much as 1,000-mile (1,609-km) range. The IAF used ground launch with rocket-assist and CH-53s fitted with Mid-Air Retrieval System equipment for recovery.

The IAF operated the 124I in 200 Squadron at Palmachim, but with major operations from Refidim AB in the Sinai. Missions over the SAM belts began immediately and returned valuable data, as they would over the Syrian batteries in Lebanon during the early 1980s. During the Yom Kippur War, the Firebees operated for 12 days, flying 25 sorties, with heavy attrition.[12] Just two remained at the end and so the new Chukar decoys from the USA were pressed into immediate service as a makeshift photo platform.[13] Although, the small mission payload capacity and range of the radio-controlled decoy greatly limited its value, numerous photo missions were flown in the months following the ceasefire. A dozen more 124Is were soon purchased, but the low cost of the Chukars meant the IAF continued to operate camera-equipped decoys, with a locally produced guidance system, especially on higher-risk missions.

Beginning in 1979 the new mini-RPVs (Remotely Piloted Vehicles) offered an imaging surveillance capability that was well exercised during the 1982 invasion of Lebanon. Both types were placed into production and routine service, the Mastiff with A'man (military intelligence) and the Scout with 200 Squadron. These could be launched from a truck-mounted catapult and recovered into a net, or operated from a small runway. They typically carried a 50-lb (23-kg) payload and flew at 55 knots for 4.5 hours. Upgrades to the Scout were introduced that increased payload and endurance by about half.

The Chukar and Firebee drones were retired in the early 1990s owing to age and operating costs. That left the IAF without unmanned, high-speed, "wet film" photo reconnaissance assets. However, the inexpensive mini-RPVs were perceived as potentially offering an alternative if their capabilities could be grown for higher resolution, color, and night imaging. In the 1990s, the IAI Searcher family of mini-RPVs met the need with more reliability and persistence. Payload could be up to 138-lb (63-kg) and endurance to 12 hours. It was learned that the distinctive noise from the RPVs would cause the enemy to take cover and escape detection, and so the Air Force worked to reduce aural signature. The small airplanes were occasionally lost to technical problem or enemy action, yet readily replaced at low cost.

The use of helicopters and light-planes to monitor the tense situation in the Territories during the First Intifadah had become a significant drain on the Air Force budget. King Airs fitted with an electro-optical (EO) sensor ball under the center fuselage in the early 2000s augmented these capabilities, the onboard operator's communication with ground teams being an advantage over UAVs. Other light airplanes such as a Stemme S10 fitted with



The F-15 continued the Phantom's tradition carrying a LOROP pod, this one called Ofir. Manufactured by IAI, it was based on the F-15's centerline 600-gallon fuel tank. The pod is here carried by a 133 Squadron F-15A. (Nir Ben-Yosef Collection)

As Air Force UAVs grew in size they were no longer as responsive to individual ground unit needs. The Ground Forces adopted mini-UAVs that included this Skylark, produced in Israel by Elbit. The Air Force evaluated and performed training for such systems, though by 2017 there was pressure to permit Ground Forces to assume such tasks itself. (Israeli Air Force)

imaging systems were operated briefly.[14] The service evaluated two-seat ultralight aircraft as inexpensive candidates for the duty, but nothing came of this. The IAF apparently undertook the evaluation reluctantly as they opposed the idea being championed by Ground Forces commanders. The idea was embraced in 2005 when Bonanzas were fitted with a flat replacement window for oblique photography and employed as such during combat operations.[15] Small UAVs began to carry some of the burden. As the mission persisted, UAVs continued to be the answer. In some cases, especially around-the-clock monitoring of narrow areas like Gaza, contractors with small UAVs outside the IAF fleet serviced these missions.

Into the early 2000s, the IDF was recognized as the most experienced and successful user of battlefield RPVs. All were subject to development and service trials before entering routine squadron employment, but the early period often saw operational use while still under evaluation. These systems were accepted as an indispensable element in the Air Force's order of battle, but the video image resolution had only limited usefulness for image intelligence. They are more reasonably considered a complement to manned photo-recce platforms. The RPVs allowed last-minute checks of bombing or commando objectives, even if manned aircraft had photographed the area previously. However, expanding technology permitted even more capable systems that might rival the manned aircraft, and the MoD began considering a new generation of RPVs. All those that followed were manufactured in Israel with, commonly, Israeli sensor packages. This permitted details of the systems to be kept close-hold. During the 2014 fighting in the Gaza Strip the UAVs flew 20,000 hours during the 55-day operation. In 2019 these assets executed 80 percent of the IASF's flight hours.

The RPVs grew in size as the mission demanded larger payload and longer endurance. Their autonomy also expanded to become Unmanned Air Vehicles, though the IAF usually still employed operators to perform the take-off and landings. The Hermes 450S was introduced in 1999 with a typical 331-lb (150-kg) payload and 20-hours endurance. Capabilities expanded again with the Heron in 2006 possessing a 500-lb (227-kg) payload and 30-hours endurance. The Hermes 900 in 2015 boasted a 700-lb (318-kg) payload with multiple sensor options. The ultimate was the Heron TP 'Eitan' introduced in 2010. This turboprop airplane carried up to 2,200lb (998kg) of mission equipment for up to 36 hours. Although not a fast jet (all the Israelis UAVs were propeller-driven), 45,000 feet (13,716m) maximum altitude reduced its noise signature and the composite structure its radar return. By 2010, most of the UAV aircraft were fully autonomous from take-off to landing. New squadrons were formed for this growing fleet and air traffic control had to accommodate the unmanned vehicles in the dense flight environment over Israel. Still eager for more responsive surveillance of distant targets like Iran, it was revealed in 2011 that Israel had negotiated with Kurds in northern Iraq to base a detachment of UAVs in the region.[16] Although not known to have occurred, this raises the possibility of covert remote basing.

The Palestinian Intifadah, arms smuggling across the borders, and the cost of around-the-clock border patrols and UAV operations, prompted the Israelis to consider tethered aerostats mounting sensor systems as a cost-effective surveillance method. The Rafael Observation Balloon System was developed in 1989 with a television camera beneath a 460-cubic foot (13-m^3) aerostat tethered at 1,640-feet (500-m) altitude. Later the 71M Airstar, the 365H by TCOM, and Top Eye were the principal platforms, all equipped with Israeli sensors.[17] Similar systems were adopted and operated by the IAF to date of writing, also employed for electronic surveillance.

Another important source of aerial imagery for Israel was reconnaissance satellites. The extreme difficulty encountered in executing reconnaissance aircraft flights over other nations, especially on a routine basis, marked the spy satellite as an essential resource. Until near the end of the 20th century, Israel obtained satellite returns solely from the United States. However, the Israelis long complained about delays or refusals in delivering images, the Americans' intentional degradation of images to conceal true resolution, and unwillingness to retask satellites to meet Israel's intelligence needs. Israel needed such assets of its own, and a secret decade-long program to develop such a system began. Air Force support was lukewarm, fearing the budget implications.

Construction of the *Shavit* launch vehicle was primarily undertaken to place a reconnaissance satellite on orbit, though executed in concert with the civilian Israeli Space Agency as a cover. Unfortunately, from its coastal Palmachim launch complex, Israel had to fire its rockets westward over the Mediterranean and against the rotation of the earth, demanding more booster weight compared with payload. The Shavit's first launch in 1988 successfully placed the *Ofeq* satellite into low earth orbit. This appears to have been an experimental platform to test various satellite functions and configurations. The Ofeq-2, sent aloft in 1990, was similar but reportedly included a camera. What was likely a prototype of the photo reconnaissance satellite was launched in 1995 as the Ofeq-3. Its orbit took it over Syria, Iraq, and Iran every 90 minutes, allowing Israel to routinely monitor these nations' nuclear and ballistic missile developments. A series of other satellites of increasing size and sophistication, to include synthetic aperture radar to image through weather, followed over the next 20 years of which some were clearly reconnaissance satellites or serving other military functions such as electromagnetic spectrum monitoring or enhancing communications.

As the Air Force's UAVs became more sophisticated, operations became split between strategic and tactical missions. Zahal required more responsive portable or squad-serviced mini-UAVs for the latter, plus nano-UAVs for urban reconnaissance. Beginning in 2003, the Air Force evaluated and procured such systems, then trained soldiers for operation at the battalion level. However, the Ground Forces began to feel all associated very-low altitude resources would best serve their mission if under their direct authority. The Air Force resisted such division and worked to satisfy the needs of its sister service. In 2017, the IASF commander appointed an artillery officer to lead the Heron squadron and a Hermes 450S unit was essentially devoted entirely to Ground Forces missions with close coordination. However, a separation was inevitable. Infantry squads were using systems such as quadcopters and A'man for recon, and such things as dropping tear gas canisters on protesters.[18] The Navy was also likely to begin operating shipboard mini-UAVs.[19]

3

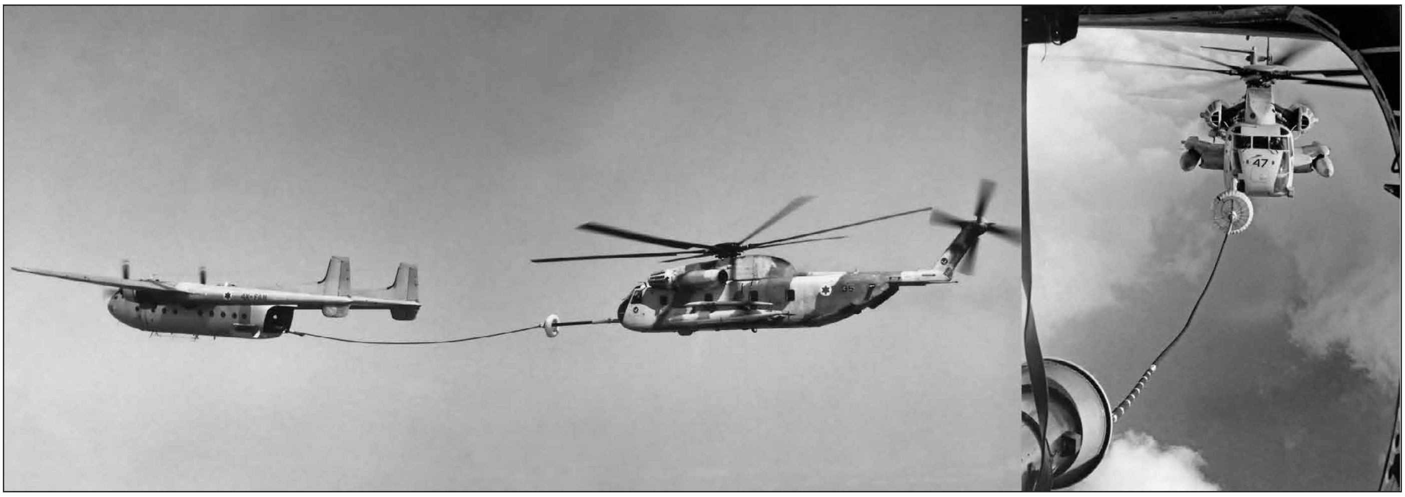
AERIAL REFUELING

The A-4 and F-4 fighter-bombers and S-65 transport helicopters the IAF began receiving in the late 1960s came equipped for aerial refueling, although the Israelis had no means of employing the capability. They saw the value in AR as a force-multiplier in extending mission range and endurance to get the most from their limited resources. A complication was that the Skyhawks and Sikorskys were equipped for probe-and-drogue AR while the Phantoms had a receptacle for boom refueling. The Americans were at first loath to provide tankers or even the equipment to create a tanker.

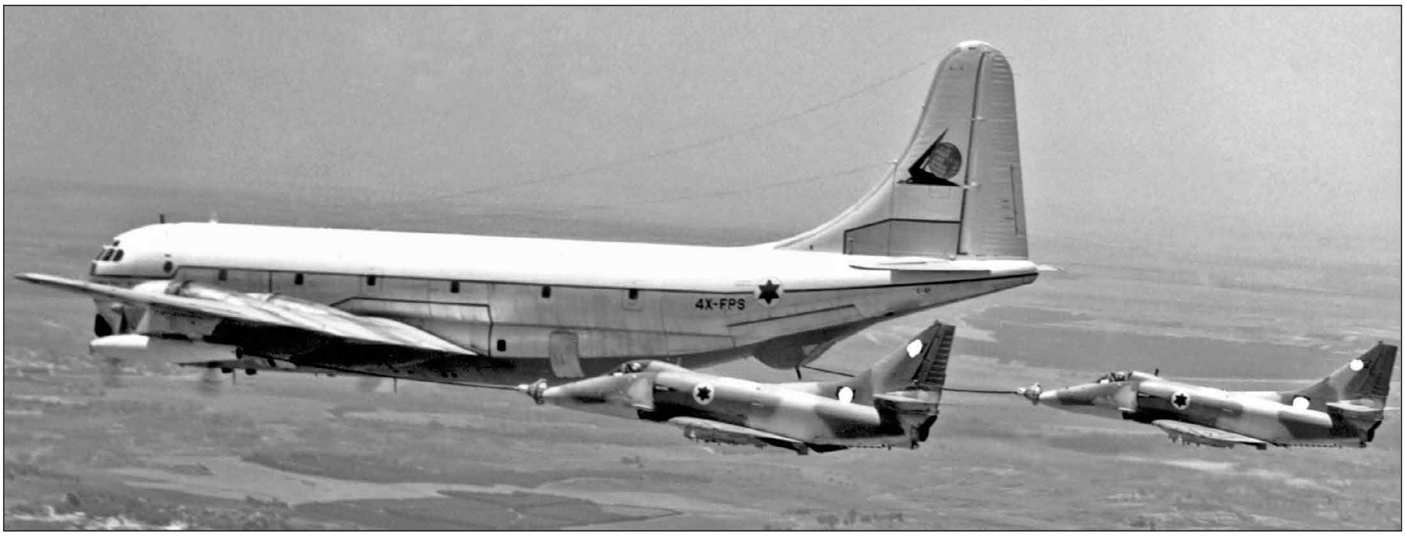
Surprisingly, the Israelis were permitted to acquire A-4 centerline buddy refueling hose reel pods. The initial Skyhawk cadre were trained in the USA to AR and they returned to train others. The maiden AR contact by an A-4 in Israel occurred on June 6, 1968. Although a marginal capability, these D-704 pods were put to immediate use with the A-4 squadrons where they supported combat operations and gave the IAF its first AR experience.[1]

After the Six-Day War, the Israelis had acquired a Vautour IIA that the French had modified as both an AR tanker and receiver.[2] Although employed as a fighter-bomber, the IAF considered employing the tanker capabilities still installed in 1968 to service A-4s, but this was not consummated. Instead, one of the KC-97s the IAF had restored to operation was modified by IAI to mount a Skyhawk D-704 pod under each wing.[3] The AR was monitored from the boomer station, the blister for which was presumably reinstalled and so rendering the cargo doors inoperable. The modification required wing strengthening, fuel system alteration (though unclear if fuel tanks were installed on the cargo deck), and system control wiring – not trivial tasks. Yet, the first AR from the KC-97 was in June 1968.[4] The fact that this is the same month as the first A-4 to A-4 buddy refueling suggests that the pods were delivered much earlier than the Skyhawks (first arriving in December 1967). It again bespeaks quiet American assistance to help Israel achieve its AR aspirations with a tanker available soon after the Skyhawks became operational – espousedly "defensive" warplanes.

Aircrew began qualification training for AR, both buddy and tanker, but the capability was not routinely employed. Unfortunately, the tanker was lost in a ground mishap in 1970.



The Israelis created an *ersatz* tanker with a Noratlas hosting a hose reel system on its cargo deck and the hose emerging from the rear freight opening (doors removed), as shown. There appears to be an enlarged strake beneath the troop door with vertical member to help create favorable airflow. This was likely in 1968 and offered an interim capability while awaiting converted Boeings. The modified transport is 4X-FAN of 103 Squadron possibly in an overall gray finish adopted for clandestine operations the Israelis called "gray missions." It is shown refueling S-65 35 of 118 Squadron and 47, the latter with a mount on the port side of the nose for a low-light television system. (Ra'anan Weiss Collection)



The first experience with true aerial tankers was the installation of wingtip hose-and-drogue pods added to C-97s to refuel A-4s that came with AR probes. Shown is KC-97G 4X-FPS 37 “Carmel,” the first tanker dating from 1968, that burned in a ground collision in 1970. The initial “contact” was on June 6, 1968. Note the boomer blister under the aft fuselage. The A-4Hs are from 115 Squadron. (Ofer Zidon Collection)

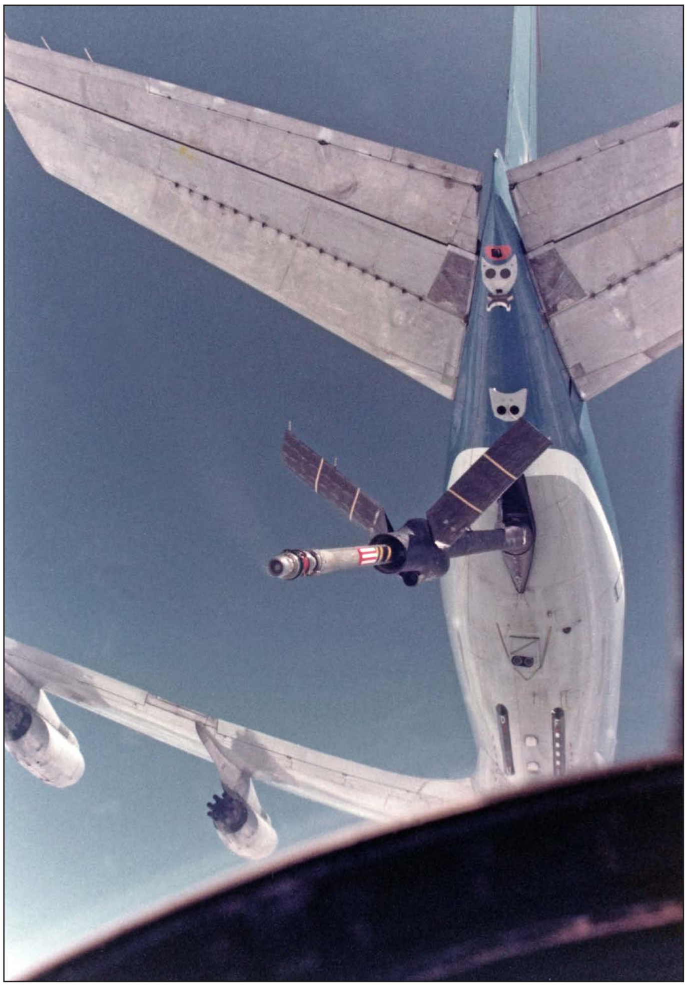
Two additional 97s were modified for the role in 1971 to 1972 with pods from the United Kingdom (UK) company Flight Refueling. While awaiting the Stratos, a Noratlas was fitted with a hose-reel at the end of the cargo deck, the pedal doors removed and likely a fuel tank farther forward, to provide AR to S-65s.[5]

These AR capabilities were very limited if not experimental into the mid-1970s and used only for special operations.[6] The IAF began developing a probe AR capability for the F-4 in 1970 as a locally designed modification. This was slowly added to some aircraft from 1971, but it was not until about 1981 that the feature began to be installed fleet-wide.[7] The probe tubing entered the fuselage and the fuel system forward of the AR receptacle. A boom could still refuel the aircraft even with the probe in place. The system served well but was not without its flaws. The service worked to fit all of the CH-53s with the removable AR probes, supplied by the Americans, beginning as early as 1973. The sale of the AR equipment is surprising in light of the continual reluctance of the USA to support the IAF’s desire for such capability. In any event, the long-range strike mission of the Phantoms particularly made it important to grow the tanker fleet to match the growing number of receivers.

One of the KC-97s tankers received a flying boom in the early 1970s to create a three-point refueling capability. This arrangement was later transferred to another airframe, but only one aircraft had the three-point assembly at any one time. The boom allowed fuel to be passed to the F-4s at more than twice the flow rate of the hose-and-drogue system. The tanker boom and belly director lights were KC-97 units. However, this arrangement was considered developmental and refueling of F-4s at the flight speed of the 97 was challenging. The single fleet example and continued modification of Phantoms with probes reflected the marginal operational value of a boom on the Strato.

If acquisition of the KC-97 boom equipment was official, it reflected another American half-compliance with its own restraint in supplying offensive weapons to Israel. It would not provide tankers facilitating controversial deep strikes on neighboring states (repeatedly refusing sale of KC-135s), but it did provide Israel the means to create the capability on its own while selling warplanes equipped as receivers. For Israel, this costly and resource-consuming approach was much resented.

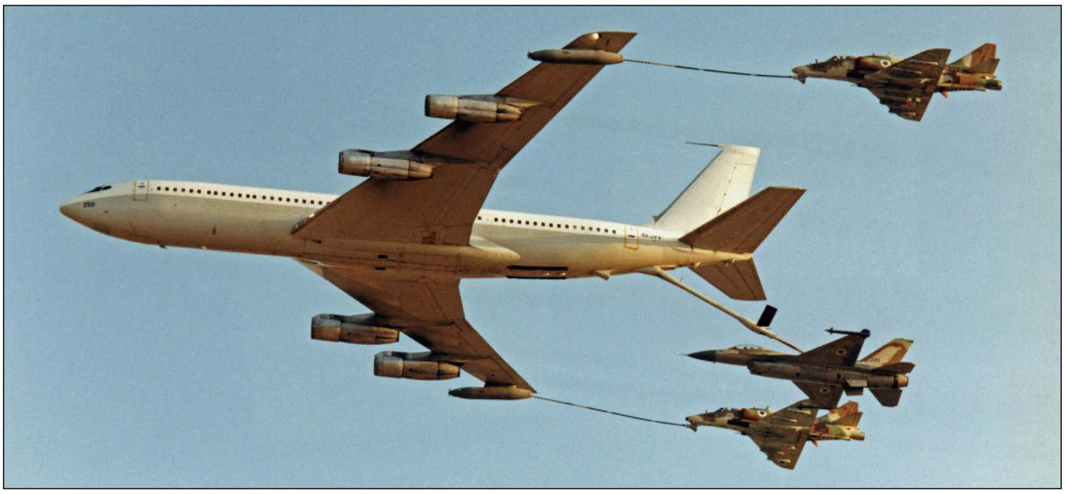
The need for operational boom tankers grew with acquisition of F-15s and F-16s. Still compelled to develop this on its own, the IAF sought to add booms to Boeing 707 airframes already in its fleet. The engineering and operational experience gained from the C-97 boom installation proved invaluable, but the project still required years of work and active if low-key assistance from the Americans.[8] The last boom-equipped KC-97 was retired in 1978 and these may have always been intended simply to gain



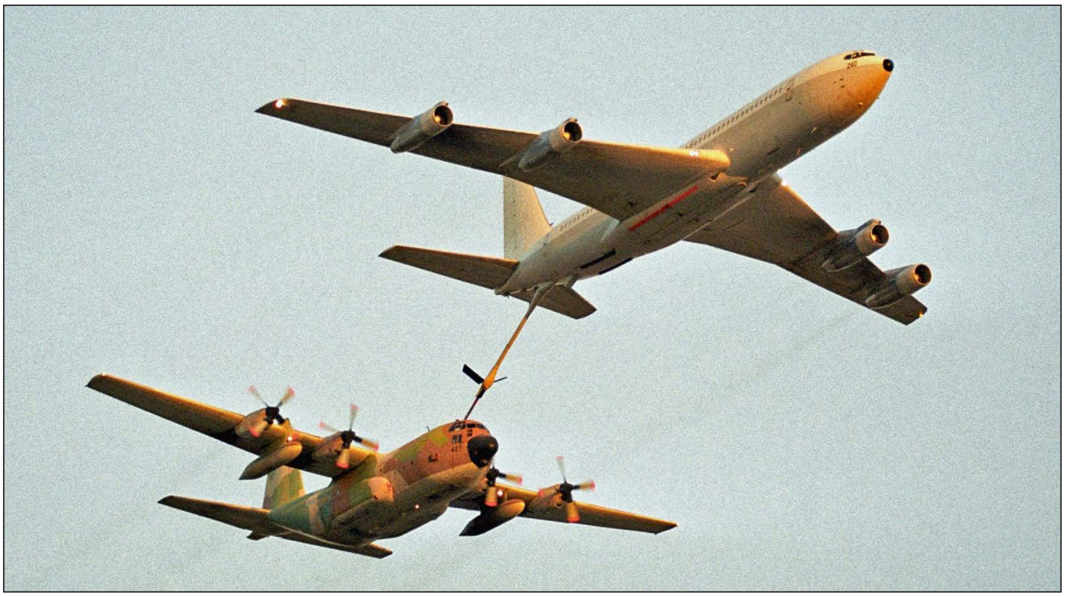
The receiver’s contact position behind the IAF’s early “KC-707” reveals some of the Israeli modifications. Israel Aircraft Industries was among the first to adopt stereoscopic television cameras for the boom operator as optical means of guiding the receiver into the contact position and then plugging their receptacle. The KC-97 boom, the various cameras, and the bottom director lights are all visible. (BIAF – Israel Aerospace Magazine) experience with such systems in anticipation of the 707 work.

The IAF contracted with IAI to adopt the KC-97 flying booms to 707s. Among the many airframe system changes was an increase in fuel capacity with addition of main cabin fuel tanks. Numerous structural, hydraulic, fuel, and electrical system changes were necessary. Unlike the KC-135, the boom operator flew the boom via television images from a conventional console in the rear of the aircraft. The images from two cameras just ahead of the boom were overlapped to provide a stereoscopic picture. Director and system status lights, identical to those on KC-135s, were mounted on the bottom of the aircraft. The IAF employed officers – pilots and flight engineers – as boom operators to allow more crew assignment flexibility. The first "KC-707s" became operational in 1983.[9] The tanker systems were improved over the years to include swapping to KC-135 booms in the early 2000s.[10]

The USA administrations again found excuses to assist Israeli airpower capability growth by supplying two KC-130Hs in 1976 as a "tactical" system. These aircraft carried fuel cells on the cargo floor that fed hose-reel pods on each wing. The ability of the aircraft to refuel the IAF's force of CH-53 helicopters, that had a speed incompatibility with the 707, provided a significant increase in specops capability. However, the Herks could also refuel A-4s and F-4s and so may have provided a transitional capability until the "KC-707s" came on line. This small number of drogue tankers probably proved inadequate as the helicopter fleet expanded, or the IAF felt that only two aircraft did not represent sufficient fleet redundancy. Hose reels continued to be integrated into the KC-707s. A prototype was created from an existing IAF boom tanker and flight testing completed in 1988. It seems certain that at least one dual-mode tanker was operational in 1989. An additional KC-130 was obtained that year by contracting for conversion by a USA firm of an H-model Herk already on force.



By the 1990s, with a large fleet mixing probe and receptacle receivers, the IAF sought flexibility with a "three-point" tanker servicing both types. Aircraft 4X-JYY 250 was one aircraft modified to fill this need, with removable tip pods, and entering service in 1989. This may have been the only such operational 707 tanker, and the pods were eventually set aside as the fleet evolved further. (BIAF – Israel Aerospace Magazine)



Permitting the C-130s to refuel from a boom saw a few Hercules modified with an AR receptacle before the C-130Js arrived with a boom receptacle as standard equipment. The C-130H 427 was one such receiver, entering the fleet in 1976. Tanker 250 was a 707-331C-H converted by IAI with as flying boom in 1984. (Ofer Zidon Collection)

By 1989, there were at least two boom tankers in service. In 1994, it was reported that the Air Force was planning to acquire additional tankers to support the long-range strike capability offered by the F-15Is, then on order. In 1997, the IAF took delivery of what was credited as its "seventh" 707 tanker, designed to be quickly converted from tanker to passenger configurations. However, it is believed that only five KC-707 tankers served with the IAF at any one time of a total 10 so converted. These include four boom-equipped tankers and two boom/drogue combo versions.

The Israelis modified additional aircraft as AR receivers, some before delivery, some with kits purchased from the USA, and some as internal projects. In 1990, the IAF modified an E-2C with a fixed aerial refueling probe to AR from KC-130s to support potential extended-range operations confronting Iraq during the Gulf War.[11] Installed on a second E-2C later, the probe was affixed within a fairing mounted above the cockpit and was developed in IAF shops. The capability was marginal as the Hawkeye was difficult to fly while performing fine-handling tasks.[12] The developmental Lavi fighter-bomber was designed with a receptacle and optional probe. At least one C-130H was given an AR probe, projecting from the port side of the forebody, above the flight deck, beginning in the late 1990s. Likewise, several later got a receptacle for boom refueling. The C-130Js were equipped with an AR receptacle prior to delivery. From 2000, several S-70s were fitted with probes and external tanks, probably to support long-range specops missions.

Although developed in the 1980s when the IAF was already beginning to operate boom-equipped tankers, the Lavi was equipped with an optional probe for basket refueling. This, however, may have been primarily aimed at potential foreign sales. Here the second Lavi prototype makes contact with an A-4 buddy refueling pod. The markings for a boom receptacle are visible on the Lavi's spine, the receptacle actually installed on this aircraft, unlike the first prototype. (BIAF – Israel Aerospace Magazine)

The rapid drawdown of the Skyhawk and Phantom fleets greatly reduced the number of fast-jet probe receivers (the Kfir never being so equipped). Final retirement in 2016 suggests the hose-reel capability of the 707s became dormant. Moreover, even the KC-130 fleet was greatly depleted, with all three grounded or in extended maintenance by 2019 and one badly damaged in a ground mishap.[13]

In examining options for long-range strike missions, the 707s, or any other large-aircraft tankers, appeared too visible and vulnerable. A return to the buddy refueling with something like the A-4 centerline hose-reel pod was explored as an option for flying the Iraqi reactor bombing mission with the F-4. This would permit fighter-bombers to fly as tankers, although very low-altitude AR is generally considered impractical if unsafe owing to turbulence and ground rush. Regardless, the same was explored with the next generation of fighters with testing of a probe extending from an F-16 fuselage as one option.[14] Another solution was an F-16 wing tank with a protruding probe for AR from a buddy pod on the centerline of an F-15D.[15] This may have been aimed at an Iranian strike option. It is unlikely any of these capabilities became operational.

Even with 10 or fewer tankers, the IASF was in the top 10 of world AR operators. With the growing age and maintenance costs of the 707s, the IAF explored tanker/transport options. A request in 2008 for the USA to assist funding two KC-767s was rejected.[16] This was at a time the Israelis were actively preparing to strike Iranian nuclear facilities and the tankers may have been to bolster the AR capabilities in support. The requirement for six tanker/transports brought an offer from IAI for the conversion.[17] Other platforms were considered, especially given that such modifications were an IAI specialty. Israel also asked the USA to contemplate selling retired KC-135Rs, although this appeared a partial measure since those airframes were quite old despite upgrades and restoration programs. The USAF's new KC-46A was the most costly option but the Americans approved the purchase of eight in early 2020 and Israel chose to proceed in the following year.

4

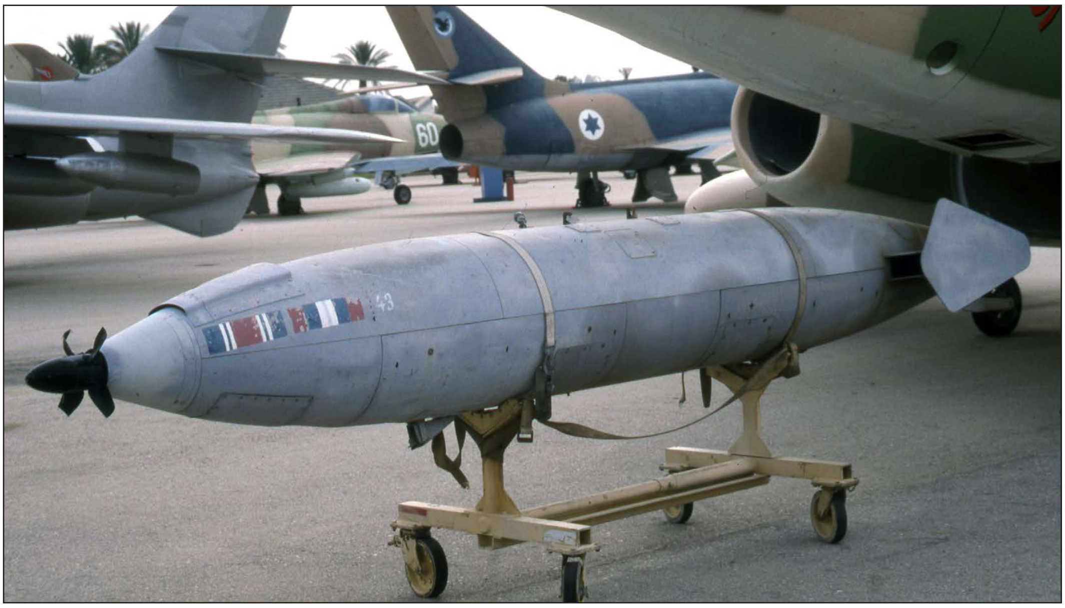
ELECTRONIC WARFARE

Few mentions of Israeli EW capabilities have been made public, and with fewer details. It is known that these grew in extent and importance over the decades to match the threats and gain a combat advantage for the relatively small and modestly equipped Zahal. Yet, the IAF would eventually become known as one of the most adept players in this realm of warfare, with excellent means and ability to react quickly when adjustment was required.

As radar and communications began to gain more importance in air defenses and control of air battles, Israel moved into the earliest stages of building an EW capability. This became more vital as the IAF came to face radar-directed anti-aircraft artillery (AAA) and SAM defenses. However, there was little money and perhaps no great appreciation for the need. That changed as the battlefield grew more complex and any measures to help tip the odds were pursued. Consequently, EW expanded over the years from gear created in IAF shops, complex systems bought from France and the United States, and unique assets manufactured in the burgeoning Israel military industries. Airborne EW came to have as great an importance as the warplanes themselves.

In the mid-1960s, the new EW field was a means of "leveling the playfield," especially in the event the long-planned pre-emptive strike was implemented. An Electronic Warfare Branch of the Material Department was established in the Air Force Headquarters (AHQ) during 1966. The Israelis began with basic barrage jammers to confound enemy voice communications and radar. These were integrated into attack jets since they flew in radio silence and employed little onboard electromagnetic equipment during that period which might be subject to self-jamming. Fortunately, the USA provided intelligence on the SA-2 and also ECM equipment to outfit some of the fighters. Again, the Israelis also built their own, learning as they went. The Vautour, with excess volume plus power and cooling capacity, was a favored platform for the larger "black boxes."

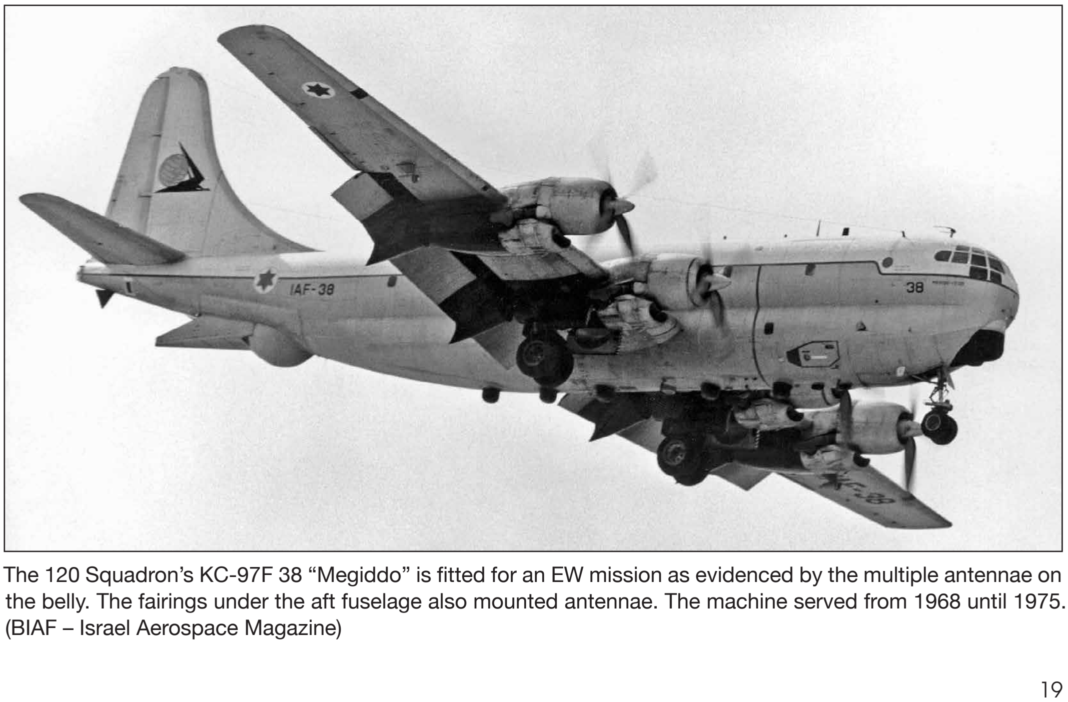
The Israelis were able to acquire a French stand-off jamming pod they dubbed *Yabelet* (Wart, Blister, or Corn). This was intended for the Vautours and based on a converted 343-gallon (1,300-l) external tank.[1] It required an onboard operator and so were integrated into the two-seat Vautour IINs. First operational in 1967, this contained the French Thompson-CSF "Alligator" noise jammer intended to defeat Soviet SAMs and surveillance radar that were causing the Israelis much concern. Two of these systems were carried at a time, with perhaps as few as four units ever constructed. For lower-speed and standoff scenarios, palletized systems may have been carried by transports as well, to include electronic intelligence gathering (frequencies and emitter geo-location). Transports were also equipped to dump chaff. Other jamming and electronic emission collection plus analysis assets were ground-based.



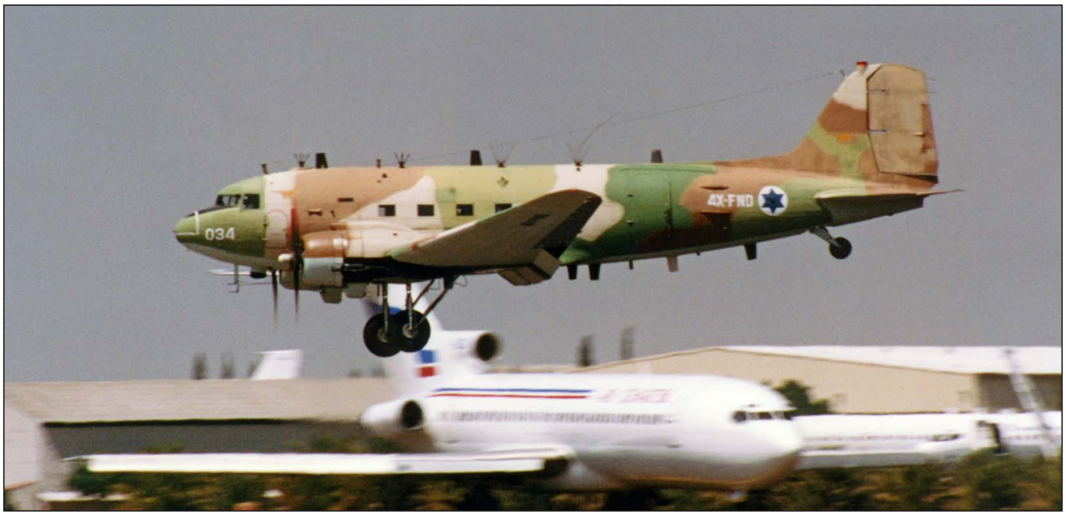
The Israelis built their first podded EW system using French electronics fitted into a 1,300-l external fuel tank for the Vautour jet bombers. This example of the Yabelet, preserved at the Israeli Air Force Museum, shows the generator airscrew on the nose and a cooling aperture added in the location of the aft fins. The pod bears the campaign ribbons for the 1967 Six-Day War and the 1973 Yom Kippur War, indicating the length of its service. (Author)

The efficiency of such capabilities during the Six-Day War is difficult to assess from available literature. The Vautours carried the Yabelet for jamming of SA-2 radar. One first wave formation was a pair of Vautour escorted by two Mirages on a radar jamming mission.[2] More such missions followed. A C-47 was also modified to jam SA-2 radar and may have flown along the Sinai coast while also performing radio intercept. Others performed radio relay. A trio of modified Dakotas dumped chaff just across the border in the Negev to help conceal the unusual air activity preceding the first wave of air base strikes. It appears that at least one Noratlas transport was also equipped to dump chaff from barrels at the end of the cargo deck and secured below the troop doors. A Strato departed at 0325, with the equivalent of the IAF deputy commander aboard, on a classified sortie that lasted nine hours, but was never detailed – possibly an EW or communications monitoring mission.

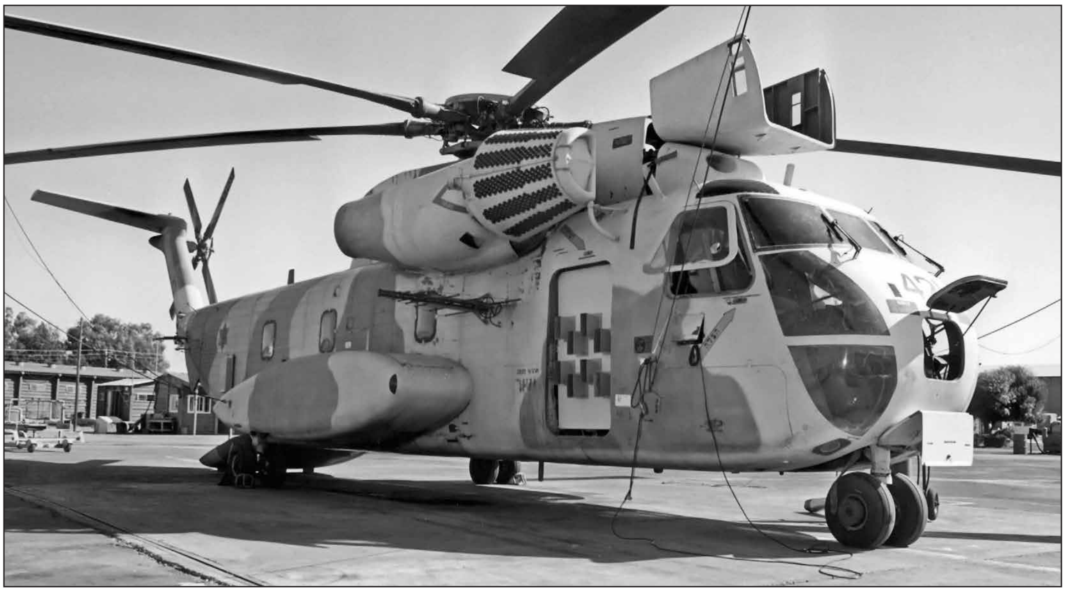
With the monumental growth in extent and complexity of Egyptian and Syrian air defenses during the War of Attrition, Israeli EW expanded to match. Electronic intelligence reconnaissance became increasingly important as deep strike bombing raids demanded data on enemy radar and missile guidance transmissions for suitable jamming, and to plot routes amongst the defenses. To contribute in this increasingly complex and dangerous environment, various EW systems were apparently added to most of the Vautours. The Yabelet pod continued to evolve, to include capabilities against the SA-3, and another podded system called Grapevine followed to meet evolving opposition systems.[3] After retirement of the Vautours, the pods appear to have been carried by Skyhawks. The EW modifications for perhaps two Stratofreighters probably included ECM to jam enemy systems in support of fighter-bomber strikes, "snooping" to determine the nature and location of enemy emitters, and communications-intercepts (COMINT). Signals intelligence (SIGINT) came via a C-97 from the USAF, augmenting capabilities from other aircraft such as Noratlases.[4] Since the fronts were comparatively narrow, jamming of tracking radar could be narrowly focused to support defense suppression strikes. Placing such systems aboard helicopters and Dakotas was one such solution as they could fly low and slow for extended periods.[5] The "Katef" system was developed with emitters in a bank that fitted into the starboard troop doors of the S-65 helicopters. There was likely an operator station and possibly power-generator that was loaded aboard and manned by support personnel.



The 120 Squadron's KC-97F 38 "Megiddo" is fitted for an EW mission as evidenced by the multiple antennae on the belly. The fairings under the aft fuselage also mounted antennae. The machine served from 1968 until 1975. (BIAF – Israel Aerospace Magazine)



In 1996, this C-47B of 122 Squadron was captured on film landing at Lod AB with many added antennae. Particularly interesting are the "whiskers" sprouting from the spine. For many years, the Dakota served as an inexpensive platform for "droning" to collect signal intelligence and possibly perform jamming. This aircraft was withdrawn a few years after the photo was taken. (Graham Dinsdale Collection)



The Israelis developed a standoff jamming system that could be installed on various aircraft, though helicopters were preferred because of their slow flight across the path of an approaching formation of IAF fighter-bombers benefitting from their radar jamming contribution. This 118 Squadron CH-53 421 shows the external portions of this Katef system with a bank of equipment installed in the forward door and added antennae aft of this on the side of the aircraft. Internally there were presumably racks of gear, operator stations, and possibly a power generator, all on roll-on pallets. Sister aircraft 931 was shot down while performing this mission. (Ra'anan Weiss Collection)

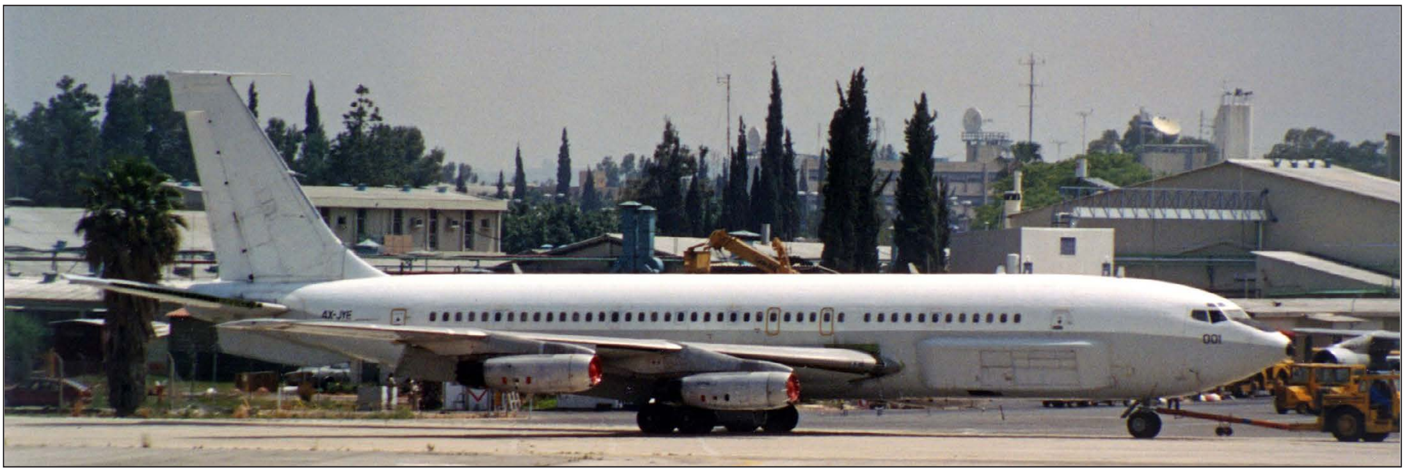
Following the War of Attrition and efforts to find a solution to the formidable enemy defenses, EW received considerable attention. Work continued to refine the transport-based systems and extend their capabilities. Likewise, the Katef was also adopted for carriage by Super Frelon and Bell 205 helicopters. An airborne EW organization, Unit 555, was formed at Tel Nof AB for such missions.[6] Where these home-grown capabilities did not keep pace with the threats, the IAF purchased expensive EW pods from the Americans for the F-4Es, or at least those the USA would release and the Israelis could afford. Possibly not the latest and best systems, they nonetheless were important additions that extended EW expertise further.

The October 1973 cataclysm stretched Israeli EW capabilities to breaking and it was found wanting. Emergency supply from America included some of the latest ECM pods for the Phantoms as well as Electronic Counter-Counter Measures (ECCM) units.[7] Mention is made of Hueys dumping chaff in advance of airstrikes. More than half the S-65 and Frelon sorties (over 1,500 hours) were devoted to Katef missions while the 205s were just 19 percent yet 2,310 hours.[8] The Stratos and Daks were just 13 percent each, though still 1,644 hours. One Sikorsky near the Suez was lost performing such a mission when it climbed high enough to be engaged by a missile.

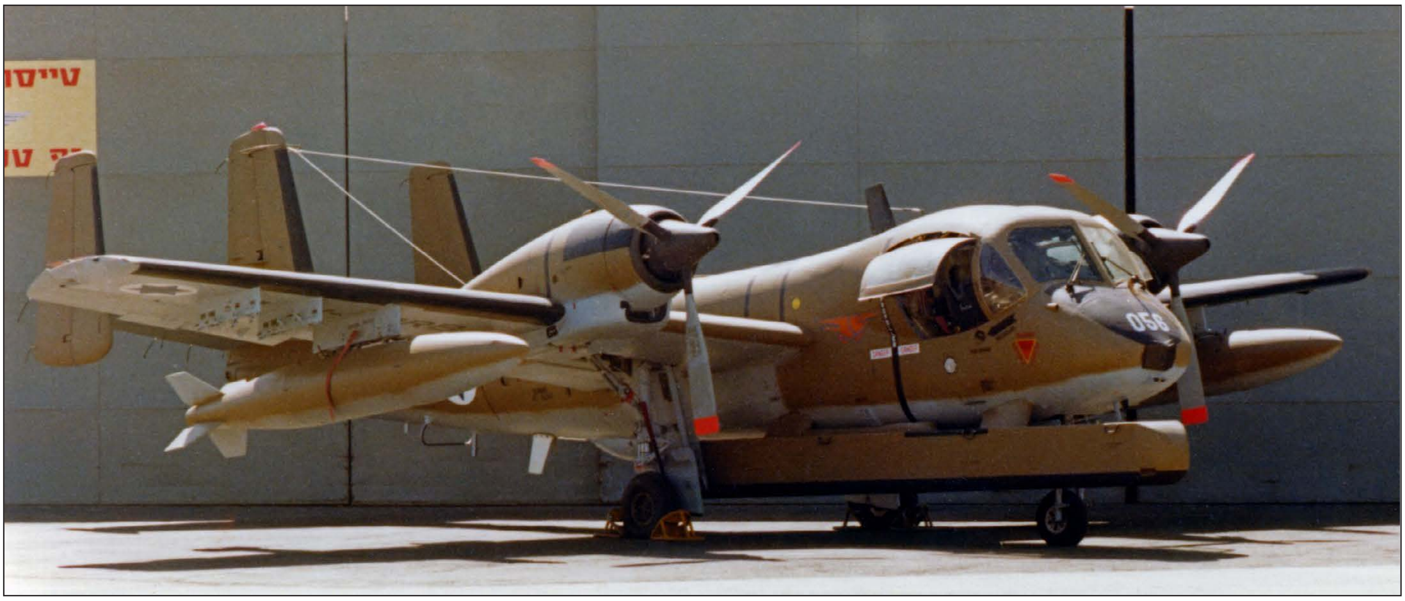
The shock of the Yom Kippur War spurred further expansion of EW. In the near-term, capabilities had to be grown by purchases from what the Americans were willing to share while resources were developed in country. In time, the USA pods were being modified to suit specific Israeli needs to include replacing much of the internal components. Israeli-manufactured pods followed. These could be rapidly altered or reprogrammed to match new threats.

While local capabilities were being grown, the IAF leased two Grumman OV-1D Mohawks from the US Army in 1974 through 1984. These would help track enemy dispositions in all weather conditions with equipment that could locate, record, and analyze electronic emission sources and then take optical, infrared or radar images of the area for follow-up attack. As part of the agreement for disengagement of forces and evacuation of the Sinai, America supplied two EC-130Hs and at least two Sea Stallions fitted for Electronic Intelligence (ELINT) and possibly jamming missions. The existence and operation of these aircraft were not subsequently disclosed but were assumed to remain in service. Chukars and TALD air-launched decoys came to include EW capabilities such as jamming and chafe dispensing. These supported short-period effects immediately in advance of a strike.

Powerful systems developed for ready alteration in meeting emergent threats could require considerable volume and subsystems support. These were usually carried by the Boeing 707s being added to the fleet, replacing the Stratos. They incorporated SIGINT, COMINT, ELINT, ECM, and ECCM. These aircraft were usually denoted by external "antenna farms," but a few had large "cheek" fairings or nose radome encompassing an array. Some gear was "palletized" to allow roll-on/roll-off through cargo doors to permit aircraft to be rapidly reconfigured to satisfy mission requirements. Most of the modifications were



The Boeing 707 replaced the Strato and likely some C-47s as the preferred platform for EW equipment and extended missions given the generous internal volume and available electrical power. This particular aircraft (4X-JYE 001) is a 707-131F photographed in the early 1990s at Lod AB, but likely serving since the early 1980s in other colors. It was modified with the "cheek" fairings enclosing an antenna array. (Graham Dinsdale Collection)



The 122 Squadron badge adorns one of the two OV-1Ds (056 4X-JYB) loaned to the IAF by the US Army. Its capability to electronically locate and photograph emitter systems was considered important in the aftermath of the Yom Kippur War. Arriving in 1974, their presence was not publically acknowledged until 1982 by which time they had been withdrawn, presumably replaced with locally developed counterparts. (Author's Collection)

performed in country with locally developed systems, but efforts were contracted out or foreign equipment acquired as necessary. The USA was the usual source of this support. Most Air Force 707s had low-key markings and so could travel abroad without attracting attention. They were kept under around-the-clock armed guard and had sections with classified equipment sealed off from even the flight crew. Any large-scale Air Force operation would commonly be supported by some of these assets.

The medium EW aircraft represented by the OV-1D was seen again with the Beech RC-12s as these were much more cost-effective and reliable than the 707s. Five RC-12Ds were acquired in 1984 and two RC-12Ks in 1991. These Guardrails supported ELINT, COMINT, and SIGINT depending upon configuration that was alterable. They also took up the tracking of pilot survival radio signals.[9] Data were transmitted to ground stations. The Israelis certainly altered these systems over the years to serve evolving needs. For homegrown systems, the IAF bought six Model 202 Aravas in 1987 to 1989 configured for the EW missions with special nose and aft fuselage radomes, and likely the ability to roll-on/roll-off palletized electronics gear and operator stations.

The last A-4 squadron in 2016 was still carrying a centerline jamming pod for operation in concert with strike formations. The fourth-generation jets had EW gear internally, though the Americans commonly deleted some USA-only tactical features. However, contractual requirements specified design changes providing volume, power, and cooling for the IAF to insert its own "boxes." This allowed the IAF to tailor such resources to its unique requirements while keeping critical capabilities close-hold. Self-defense systems were also added using mostly Israeli-manufactured components. Their combat aircraft became known for having the most flare/chaff dispensers, and sprouting more antennae and "warts" for detecting and defeating electronic threats fielded by other countries. Some of the advanced fighters were believed to possess towed decoy systems.[10]

With the advent of practical and capable UAVs, various forms of EW were adapted to these platforms because of their ability to remain on station for up to a day, their lower chance of detection, and the relatively quick reconfiguration that could be performed. They also risked only a comparatively inexpensive airframe instead of a combat aircraft and aircrew over opposition territory. However, their small size plus more limited power-generation and cooling capacity made them an adjunct to the manned platforms. The Heron and Eitan are most frequently seen with the antennae indicating EW missions. In the 2000s, electronic surveillance from the UAVs was proving an important as imagery. Aerostats were also employed for persistent ELINT and COMINT collection.

Important capabilities remained on the aging 707s while the IAF considered alternatives. Attempts to acquire RC-135V/W Rivet Joint electronic warfare aircraft from the USAF were unsuccessful. It was only in the early 2000s that the Boeings began to be replaced as Israel acquired three Gulfstream V-based SIGINT aircraft. However, the IAF clearly needed a replacement for the aged 707s that would likely be the same platform selected for the tankers. The F-35Is also brought important ELINT capabilities, with data distribution offboard for further analysis.

The ability of the service to penetrate Syrian air defenses seemingly undetected in the 2007 strike on the nuclear plant was an indication of EW spoofing, or possibly another capability. Cyber warfare was embraced by the IDF in the new century to offer additional means of bringing down enemy networks or planting misleading information. Such means certainly augmented airborne EW assets.

5

SUPPORT OF SPECIAL FORCES

From its earliest days the IDF emphasized small, special unit missions as part of intelligence gathering and reprisal raids. This was partially to contain costs, but also due to the low readiness of regular forces and preventing the scale of operations from escalating. The Air Force initially assisted these missions with light-planes for scouting, radio relay, plus some liaison and casualty evacuation with landing near the squad. The Cubs could also deliver light supplies to include dropping parachute-recovered bundles from underwing racks. Later light-planes retained the capability to drop bundles out of doors. If matters grew serious, airstrikes could assist a force withdrawing after being discovered. In preparation for large operations, the IAF trained with paratroops throughout its existence.

The initial special operations (specops) units were about the only reliable ground combat force in those early years, and they became the core of the capable army that emerged by 1956. Yet, the units continued and even proliferate as the threats grew and special forces worked to prevent terror attacks and suppress militant organizations. Several *Sayeret* (reconnaissance squads) emerging over time, each with their own specialties. All occasionally required support from the Air Force.

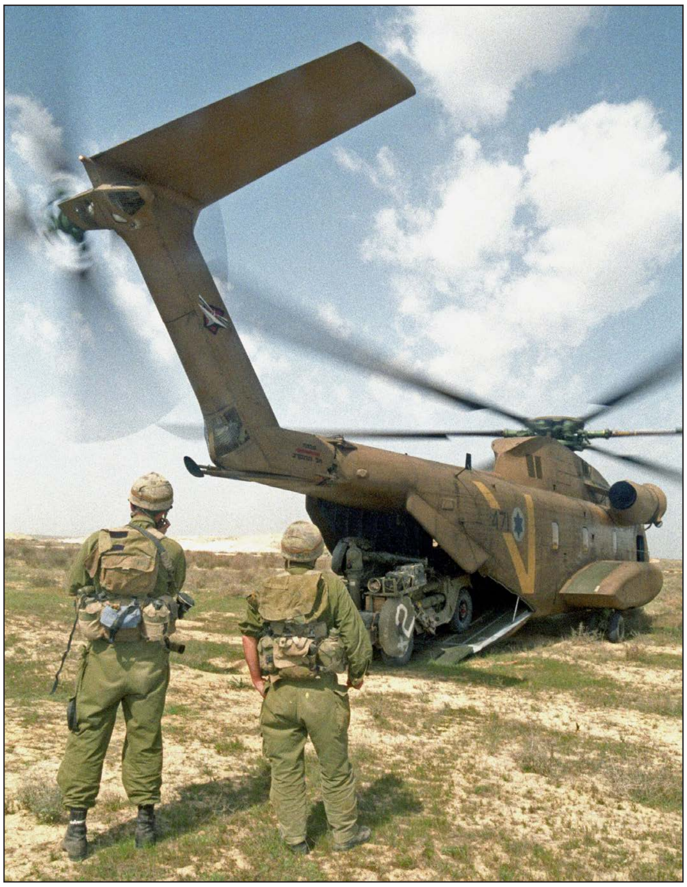
The nature of the support emerged with details of missions the Israelis chose to highlight. There were probably many failed missions that were not reported, as well as successes that remain classified. One of the failures occurred on the night of November 1, 1956, during the Sinai Campaign. The Navy's Flotilla 13 commandos were to be dropped near Sharm el-Sheikh by a Dakota, along with two motorized kayaks slung beneath the wings. The Dak aircrew the team usually worked with was on another mission. The substitute crew became lost in the dark and turned back, much to the fury of the Navy men.

Two Sikorsky S-55s, civilian version of the H-19, were procured and made operational soon after the Sinai Campaign. They allowed good experience in heliborne assaults with small-unit vertical insertion and extraction. However, the S-55s were too limited and the heat played havoc with the reciprocating engines. Yet, they established the troop helicopter as ideal transport for special forces, and persisted thereafter. (Ra'anan Weiss Collection)

The acquisition of troop helicopters in the mid- to late-1950s, and training for night operations, was a boon to the specops units. Vertical insertion and extraction and providing suppressing fire at the landing zone (LZ) with door guns, allowed greater mission flexibility and speed. Helicopter transport expanded into the mid-1960s as the S-58 team grew and became more experienced. Much the same medium lift was performed later with the evolving fleet of Bell 205s and 212s, then UH-60s. The Super Frelons added high capacity with a drop-down ramp, expanded with the CH-53 for heavy lift. As Israel moved to American equipment, and each new type had a different internal capacity, repeated and frustrating shifts in the size of the squads to be carried were necessary.

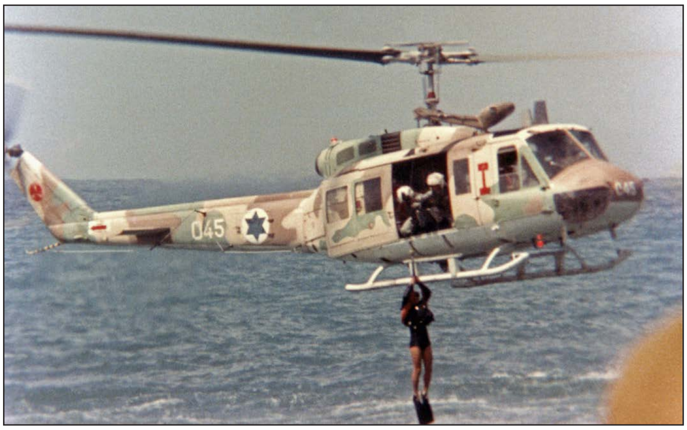
The limited inventory of equipment continued to require innovation in answering unique specops needs. As an example, 550-lb (250-kg) and 1,100-lb (500-kg) explosive devices and mines had been devised for delivery by troop helo, probably carried as a sling load and fuzed as the cable was released.[1] The October 31/November 1, 1968, attack deep inside Egypt saw the assault helicopters lower demolition bombs to the appropriate spot on a dam and bridge. The December 1, 1968, attack on Jordanian bridges used similar "sprinkler" bombs.

Only a short time after the arrival of the S-65s, on the night of December 25/26, 1969, these machines were used to snatch



The IDF formed a special anti-tank combat group, Koach Peled, with one element being air-mobile. This 114 Squadron CH-53 carries a jeep fitted with a TOW launcher and rounds indicative of this capability. It could deliver the vehicle and its crew to advantageous positions to engage enemy tanks and then retrieve them. (Ofer Zidon Collection)

a Soviet P-12 frequency-shifting ground control and intercept radar, with special capabilities to detect low-flying aircraft. The unit was critical in upgrading the Egyptian air defense network and halting the humiliating Israeli airstrikes. For the Israelis, determining the equipment's operating specifications and devising countermeasures before the F-4E deep strike bombing missions commenced could prove crucial. Further, demonstrating that such cutting-edge equipment, used to defend the Soviet motherland, were at risk of disclosure to the West if supplied to Egypt might prompt the Union of Soviet Socialist Republics to withhold such gear. Frelons deployed the assault team on the Gulf of Suez coast to seize the site while cutting the operations and antenna/generator shelters from their truck beds. The only two S-65s then in service were called in to lift them away and fly them to Sinai.



Helicopter support of special operation teams included assisting the Navy's Flotilla 13. Apart from airborne delivery and retrieval of divers, as demonstrated by this 124 Squadron Bell 205, they also would permit personnel to rappel down ropes in boarding vessels at sea. (Ed Okun Collection)

Even in the midst of war, with less time to plan and prepare carefully, the IDF carried out bold special forces operations facilitated by the Air Force. During the Yom Kippur War, an S-65 flew a team deep into Syria on the night of October 12/13 to blow up a water conduit bridging a highway to slow the movement of Iraqi forces into the theater. Mines and fire from a jeep-mounted recoilless rifle slowed the enemy during the demolition. The burning vehicles then served as beacons for F-4s to wreak more destruction, but the Air Force responded with just a single sortie.[2] A similar operation with two Sikorskys the following night landed at the wrong location and the force was discovered while trying to advance cross-country.[3] The team was barely extracted while collecting numerous holes in the aircraft. The helicopters also flew commando missions into the Egyptian heartland to disrupt the enemy rear. On the night of October 10/11, a pair of S-65s flew artillerymen, shells, and two 105-mm guns to a ridge opposite Suez City and commanding the main resupply artery with Cairo. The team shelled the road for nearly an hour before being extracted. This was repeated on 17/18th with the guns shelling military posts and a nearby electronic monitoring station.[4]

Safety and performance were increased with each new helicopter type, and as aerial refueling plus self-defense systems were added. The introduction of low-light television, Forward-

The IAF maintained off-field airlift capability since its earliest days. For high-capacity delivery, they relied on their large transports that were able to land in many areas of the local battlefields. Here a formation of C-130Es and Hs operate remote from their air base for an exercise. (Ofer Zidon Collection)

The Aeromedical Evacuation Unit served to recover downed aircrew in difficult circumstances as well as general emergency situations, especially employing helicopters to winch the "operator" and the survivor aboard. The team operated with whatever aircraft were suitable and available, but some of these were fitted with special medical gear. This UH-60 shows many of the Israeli-developed self-defense additions to the aircraft. (Ofer Zidon Collection)

Among the numerous reforms put into motion following the Yom Kippur War was creation of a special forces unit within the IAF. The Yechidat Shaldag had roles supporting Air Force missions but was most commonly used for general specops missions. As seen in this image of training at their Palmachim AB facilities, they resembled elite infantry soldiers. (Israeli Air Force)

Looking infrared (FLIR), and Night Vision Goggles (NVG) were additional steps to enhance night operational safety. The machines were also known to carry special gear or explosives as sling loads or lowered via the door winch. The Hueys and UH-60 were invaluable in delivering Flotilla 13 commandos to vessels at sea with the soldiers rappelling onto the decks as the helicopters hovered above.

Airplane delivery capabilities improved with modern equipment possessing greater navigational means. The paratroops trained for various air assaults by jumping into the objective or were air-landed at a suitable location. The seizure of airfields was one mission facilitating the latter method. This was greatly aided by acquisition of the C-130 with its ability to land on semi-prepared surfaces. The drop-down loading ramp accommodated vehicles mounting weapons like recoilless rifles and anti-tank missiles.

The most memorable special operation supported by the IAF was the raid on Entebbe airport, Uganda, on the night of July 3/4, 1976. The IDF rescued 103 hostages, passengers and crew of an Air France airliner hijacked on June 27. All but the Jewish passengers and crew were released. The aircraft alighted in Uganda, ruled by bellicose Idi Amin Dada. Demands for freeing the people included Israel releasing prisoners, but she had vowed never to negotiate with terrorists.

The IDF immediately began examining military options and collecting intelligence. Two Israelis rented a Piper Cub in Kenya and overflew Entebbe airport to photograph the field. It was concluded that a flight of C-130s could reach Entebbe, land, and disgorge troops with a good chance of retaining the element of surprise. Israel had assisted Uganda years before and helped build the old terminal where the hostages were held, and so some of its airlift pilots had experience flying into the field. Teams began training for the mission.

The Hercules took off from Ophir AB well over gross weight and, given the hot day, struggled to climb with shallow turns. The route was down the Gulf of Aqaba and the Red Sea then across African. The formation flew below the radar horizon until making landfall, escorted by Phantoms until the fighters reached "bingo" fuel. The 2,400-mile (3,862-km), 7.5-hour flight had to avoid weather, but arrived within minutes of plan. The first darkened C-130 sequenced in behind a commercial flight, landing on the main runway that was far from the old terminal.

The Herks flew in approximately 100 soldiers made up of the paratroop Sayeret Golani infantrymen, and Sayeret Mat'kal (General Headquarters recon commandos). The lead aircraft off-loaded 10 paratroopers who positioned several dozen beacon lights to provide illumination should the Ugandans turn off the runway lights – which they soon did. The other three aircraft soon landed, two carrying a Soviet armored personnel carrier each to protect the assault team and hostages, plus destroy 11 Ugandan fighters on the field. An element moved to take the control tower. The first aircraft also brought in a black Mercedes and two Land Rovers, the same as the Amin entourage. A team drove these to the Old Terminal and it bought them enough surprise to dispatch the terrorists and free the hostages. Three hostages were killed and seven wounded in the crossfire, and the IDF force commander was fatally shot. A snag was the breakdown of the secure communication network for the operation, forcing the team to broadcast in the clear.

The four 130s spent about 50 minutes on the ground. They had planned to pump fuel from the Entebbe fuel pits, but this proved impractical in the darkness. Instead, they flew to Nairobi, Kenya, where the government had promised to refuel the airplanes if the matter remained secret. There an IAF 707 was serving Command, Control, and Communications (C^3) functions and another as an airborne hospital that took on the casualties. The C^3 aircraft had been airborne providing radio relay during the assault. The force then flew on to Israel, ending the longest-range IDF operation.

From about the time of Entebbe, and even for units marching to their objective, there were probably few special operations not supported by at least one Boeing as a command post, to relay communications, monitor enemy communications, and provide jamming. Appropriate aircraft were on standby to render assistance for potential contingencies to include on-call air support and emergency medical airlift. The tactical airlift was grown with enhancements to the C-130 fleet to include aerial refueling and use of NVGs. After 2000, some Herks were modified with an EO ball mounted under the nose for safer low-altitude flight at night. The C-130Js arriving in 2014-2017 came equipped with FLIR.

The Air Force developed its own special operators during the 1970s. The Aeromedical Evacuation Unit (AEU, or Airborne Rescue and Evacuation), Unit 669, was formed in 1972 principally to facilitate recovery of downed airmen. This came after the botched rescue of crewmen from two F-4E fighters that collided over the Gulf of Aqaba and the poor resources to affect rescue during the INS *Eilat* sinking in 1967. The great need for professional combat search and rescue (CSAR) was emphasized during the October 1973 war when a SAR Center was improvised. The AEU helicopters featured emergency medical equipment and carried a physician (one of the earliest airborne assignments for women) as well as specially trained soldiers to help defend the LZ and assist survivor recovery. The AEU began operating in 1974 and their first combat test was Operation Peace for Galilee in 1982. All CSAR and airborne rescue activities were brought under its umbrella in 1978. Civilian rescues were the more common missions. Aircraft employed over the decades have included C-47, Bell 212, CH-53, UH-60, AS.565, and C-130.

The lesson from the Yom Kippur War regarding turn-around time for intelligence affecting air operations was cause to create the IAF's *Yechidat Shaldag* (Kingfisher Team) or Unit 5101 based at Palmachim AB.[5] This team would be inserted ahead of a strike to reconnoiter and photograph the target, laser-designate for the delivery of weapons or mark by other means, assess battle damage, or execute other ground force actions in coordination with airpower missions. During the early 2000s, this force predominantly performed general commando missions unassociated with air operations owing to the high workload.[6] In this guise, the Air Force essentially operated a battalion of elite infantry soldiers. The Shaldag were to be commonly inserted and extracted by assault helicopters and might mark an LZ for a larger lift or airdrop while remaining to defend the site. They probably also served to secure an area to be followed by the Yahak forward landing unit. Established in 1972, the Yahak team surveyed or created temporary airfields for C-130 and helicopter operations away from primary bases.

The IAF established an Air Special Forces Group under a colonel within the AHQ for oversight. In 2012, the IDF formed Depth Command that coordinated all the specops units' activities under a single command and planned unique combined-forces operations in addressing distant threats.

The ability of the assault helicopters to add firepower to the specops units when inserted was facilitated with several programs. The heavy-lift and relatively long range of the CH-53s made it suitable for carrying large weapons to engage targets where a reasonably undetectable approach was helpful. Some tests were performed in the 1990s with launch containers for eight long-range, 215-lb (98-kg) Nimrod laser-guided anti-tank missiles mounted on the sponson external tank points. This could support a specops mission in which the helicopter brought in the team to "laz" a high-value target, the aircraft fired the missiles, and all went out the way they had come via low-level night flight. What capabilities were actually fielded remained to be revealed at time of writing.

A similar effort involving the Black Hawk was undertaken in 2007 in cooperation with Sikorsky. This sought to integrate Israeli avionics and weapons for greater mission flexibility supporting specops or augmenting the Apaches in the wake of the Cobras' retirement. Avionics included mission management computers, cockpit displays, Helmet-Mounted Displays, datalink, plus a FLIR and targeting ball in the nose.[7] Armament included a cannon under the belly and weapons mounts at the outboard ends of the long stub wings that kept the tanks inboard. The wing-mounted weapon was likely the Israeli Spike missile. The IASF began testing the modified UH-60L in 2008 with plans to return it to standard configuration after trials. Ultimately, further work was discontinued.

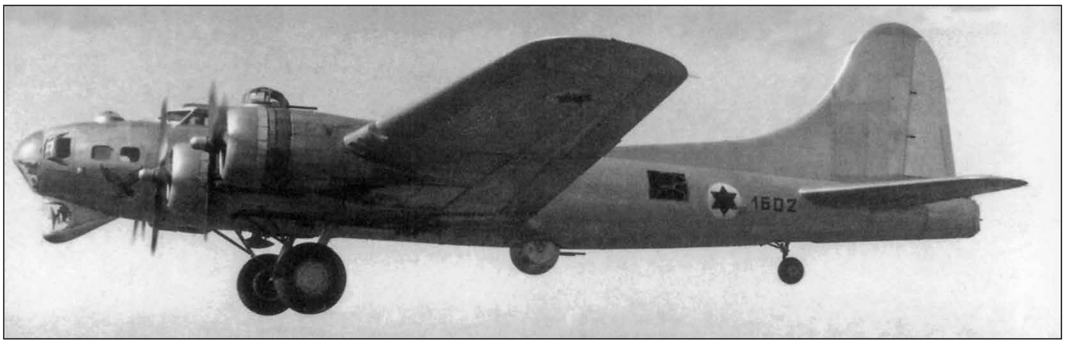
Purchasing or developing unique resources in small quantities, and training for specialized missions, is costly. The IAF did it because of the importance of specops in the nation's defense.

6

SUPPORT OF THE NAVY

The IDF/AF always provided support to the Israel Navy (IN) as an ancillary mission. Before the Navy had grown much, the Air Force was flying coastal patrols – essential because almost all goods and raw materials then came and went by sea. The IAF also trained for sea attack in cooperation with the IN, but dedication to this mission fluctuated over the decades. The IAF participated in several attacks on ships at sea and in port during the wars. Even after the Navy began sailing potent warships, and some with helicopter decks, the IAF continued servicing these missions. Close coordination between the services matured over the years.

During the War of Independence, the Navy consisted of a rough collection of commercial vessels with guns mounted. They were no match for the surface combatants of the enemy. The Air Force responded whenever Egyptian warships appeared to shell coastal



One of the three B-17Gs, 1602, was fitted with an AN/APS-3 radar having the dish in a fabricated chin fairing. This supported sea patrol, but the bomber carried the radar only from 1952 to 1954 after which the B-17s were stored to shave operating costs. (BIAF – Israel Aerospace Magazine)

The addition of three PBY-5 Catalina amphibians to the IAF fleet (3403 shown) were ultimately judged a mistake. They added little to the sea patrol mission land-based aircraft could not perform more efficiently. The seaplane features were very little utilized and only added to the maintenance headaches. The Catalinas served from 1952 to 1956 only, this example with markings crudely concealed by the Censor. (Ra'anan Weiss Collection)

In answering the threat of terrorists landing from the sea, maritime surveillance was beefed up with three Israel Aircraft Industries 1123 Westwind business jets modified with a sea-search radar. The Sea Scans were introduced from 1979. Aircraft 4X-CJC 29 (later 4X-JYR 929) wears the 120 Squadron badge on the tail and the emblem of its Maritime Flight on the nose. (BIAF – Israel Aerospace Magazine)

installations, always driving them off. In one case it damaged an Egyptian vessel and guided an IN ship to the craft that was then boarded and seized. Such operations cost the lives of one Air Force crew when their aircraft was shot down by flak.

After the war, the Navy continued to be lightly funded and with poor vessels. Aircraft were clearly the best means of patrolling sea approaches, and such operations were coordinated with the IN. Two B-17s were fitted with radar, the scanning antenna installed under the nose. This became the B-17s' primary mission at the end of 1954 when the bombers were transferred to the Maritime Flight of 103 Squadron in Haifa where the IN was headquartered. The airborne radar augmented the shore-based and shipboard radar search. The mission was soon taken over by three PBY-5A Catalina amphibians, though without radar. These seaplanes were also intended to ensure communication with Eilat should it become isolated during hostilities.[1] When these aircraft were withdrawn in 1956, several C-47s were modified to carry a radar pod under the "chin" with operator station in the cabin along with a long-range fuel tank.

On several occasions, airplanes dropped flares to facilitate naval gunfire on shore targets. During the 1956 war, an Egyptian destroyer attacked Haifa before being driven off by a French warship. A Dakota located the vessel and dropped flares after which it was ineffectively engaged by IN destroyers. A pair of Ouragans then struck and disabled it, allowing the vessel to be boarded. Another ship steaming to reinforce troops at Sharm el-Sheikh was sunk by airstrikes.

Another event during the Sinai Campaign was less illustrious. During the fighting to secure Sharm, Mustangs and Mystères shot up a British frigate mistaken for an Egyptian vessel. Something similar happened during the Six-Day War when an American electronic intelligence collection ship, sailing in international waters off northern Sinai, was attacked. Claimed to have been mistaken for an Egyptian warship and that it was not flying a flag, it was hit by Mirages and Super Mystères before being torpedoed by IN boats and then approached by Super Frelons with what appeared to be a boarding party. The USS *Liberty* managed to limp away with many dead and wounded.

As in 1956, following June 1967 some IAF officers point to these results and insisted that there was little a ship could do that their aircraft could not also perform, and at lower cost. This likely generated some inter-service rancor. The Navy pointed to their ability to remain on station, especially in poor weather, and positively identify targets. However, IN funding was always the lowest of the services.

On the first day of the Yom Kippur War, an F-4 sank an Egyptian missile boat with the aid of A-4s dropping flares. Thereafter, the IN and its fast missile boats (FMB) undertook a successful

As a first step to a dedicated shipboard helicopter, the Israelis acquired two used HH-65 Dauphins in 1985. One of the pair, 901, is seen during the late 1980s approaching a vessel off Haifa harbor. (Ofer Zidon Collection)

The Heron 1, with maritime radar and EO ball under the nose, replaced the Sea Scans for ocean surveillance. One of the UAVs is seen here restrained for an engine run in a shelter at Palmachim AB and wearing the badge of 200 Squadron. (Ofer Zidon Collection)

campaign against enemy warships with little assistance from the preoccupied Air Force.

Clearly, cooperation between the two services was essential in achieving the best solution for sea control and coastal protection. This was evident during a tragic event in 1968 when the IN submarine *Dakar* went missing during a delivery voyage from the UK. The extensive air search failed to locate any sign of the boat. Searching for ships in distress were always a part of the IAF mission. The Mirage IIICJ radar proved a disappointment for air-to-air combat but had a fine capability for detecting small objects on the ocean. Consequently, some radars were retained for ocean surveillance after all the others had been replaced with ballast.

The IAF performed sea rescue with their helicopters that were invariably fitted with a winch above a side door. This and the Mirage radar proved beneficial during another crisis when, on October 21, 1967, Egyptian ship-to-ship missiles sank the destroyer INS *Eilat*. Rescue operations were quickly launched, with Mirages locating the site after dark. Within an hour of the attack, Noratlas transports dropped inflatable rafts to the seamen by the light of flares repeatedly deployed by fighters patrolling overhead. Super Frelons rescued 50 sailors and S-58s 13, another 47 perishing. The ability of the few float-equipped Frelons to alight briefly on the sea was of great utility in this event. The initial purchase of Bell 205s from Italy included 12 pair of inflatable side flotation bag units for setting down in low sea states.[2]

The 1970s saw several instances of terrorist bands executing landings on Israel's shores using small craft launched from ships standing well offshore. The few that succeeded in completing their murderous operation before being neutralized was cause to beef-up coastal patrols. Aircraft were, as always, the best means of spotting such small craft and directing Navy or Air Force resources to respond. Over the years, mostly light airplanes and helicopters occasionally performed this role, the crew employing powerful binoculars. Attack helicopters hit a few of the squads once spotted. This, however, was a strictly visual search. A few relatively inexpensive aircraft platforms could maintain an efficient around-the-clock radar patrol.

The Navy formed a Maritime Surveillance Flight, or simply Naval Flight, in late 1976 as part of 120 Squadron to provide dedicated patrol and transport services using IAI Westwind business jets. Three of these machines were modified to Sea Scan standard with delivery between 1978 and 1983. A bulbous nose enclosed a powerful sea search radar and an improved navigation system was installed. Bulged cabin side windows supported visual search with binoculars and night vision goggles. Location data was downlinked to ship or shore C^2 nodes for action.

The Sea Scans were maintained for the Navy under a commercial contract. The pilot, copilot and navigator were Air Force personnel while the cabin crew was Navy. The surveillance officer was the mission commander and had an assistant, the radar operator, and two observers. The cabin personnel were some of the few aircrew positions available to women recruits until near the end of the 20th century. The Sea Scans were partially responsible for the dramatic drop in the landing of terrorists from the sea, with none successful after 1977.

The Sea Scans remained in service for decades, upgraded as necessary to include addition of a retractable EO sensor ball.[3] Options to replace them either failed to measure up or died in budget battles. This included seeking aircraft capable of dropping sonobuoys and torpedoes. The King Airs with belly mounted EO system and C-130s with FLIR ball augmented the Sea Scans.[4] In 2011, after years of evaluation, four IAI Heron 1 UAVs, mounting a maritime radar and electro-optics ball, began supplementing the two remaining Sea Scans (one withdrawn in 2008).[5] These were particularly favorable given their ability to remain on station for up to 24 hours. The remaining Sea Scans were retired in 2017.

The Air Force and Navy first experimented with ship-based helicopters in 1962 as a means of visually guiding the developmental Luz anti-ship missile. Improvised helicopter decks were installed on the destroyers *Eilat* and *Yafo* for the Alouette II, but S-55s and S-58s also conducted sea trials. The visual guidance method proved impractical and operation of helicopters at sea ceased.

By the time of the October 1973 war, the IN fleet of FMBs were armed with the Gabriel radar-guided missile. Over-the-horizon (OTH) targeting (versus line-of-sight) for mid-course guidance updates would permit full exploitation of the weapons' range. This could be provided by airborne radar using helicopters operating from the ships.

Experiments with shipboard helicopters resumed in 1975 with the Bell 206. It would clearly not serve for the OTH targeting role since it did not possess a radar, but valuable experience was gained to allow planning for ship modifications and future aircraft selection. Trials began with an IAF JetRanger flying from on the Sa'ar 4 INS *Tarshish* (commissioned in March 1975), a helicopter pad replacing the aft 3-inch gun. Testing then continued in 1981 with a 206 operating with the *Nirit*. This was an experimental Sa'ar 4.5 FMB that featured a helicopter deck and hangar. It is possible that the Bell was actually considered for continuous service in the shipboard role, especially as the two-blade rotor supported stowage in the small hangar, but it was found to be unsuitable for the maritime environment.

The 500MD attack helicopter was reportedly used in trials of shipboard helicopter operations on the *Nirit* in about 1981. The Defender was cleared for use aboard the boat but found to be generally unsuitable. Although the Hughes machine did not possess a radar, sea launch and recovery did allow some additional options for supporting special operations such as the Navy's Flotilla 13 commando team. Two of the attack helicopters flew off Navy decks in August 1984 to hit targets 106 miles (171 km) north of the Israeli/Lebanon border.[6] However, it is doubtful that the Defender ever went to sea after 1984 or served aboard any ship routinely.

In the early 1980s, the IN evaluated several candidates for its naval helicopter mission. Limited budget and the need to buy American if using USA funds led to the purchase of two used HH-65 Dauphins. Beginning in 1985, the helicopters, with radar, allowed the service to gain a few years' experience and form combat doctrine plus operating procedures before seeking aircraft specifically equipped for the IN mission.

The Dauphins were owned by IN but operated by the IAF. They initially served as a Maritime Helicopter Flight of 124 Squadron at Palmachim AB. The crews consisted of two Air Force pilots, a mechanic, and an IN maritime support officer. A second crew was normally accommodated aboard the boat. A landing officer directed the pilots to a safe touchdown. Israel always used experienced helicopter pilots to man the IN rotorcraft because of the added challenge of landing on the decks of the small missile boats. Training of the shipboard team included rapidly securing the helicopter after landing, folding the rotors, and moving the aircraft into the small hangar.

The Dauphin experience was so positive that by 1987 the IN was looking to acquiring its permanent solution. Fiscal pressures again intruded. Consequently, the Dauphins flight was formed into the 193 Squadron in 1987 at Palmachim. Another budget squeeze was cause to deactivate this outfit between 1990 and 1995. When operations resumed, the 193 had relocated to Ramat David AB.[7] The Dauphins would soldier on for 11 years, reduced to one following a fatal crash in 1996. A shipborne UAV alternative was explored, but without success. In the meantime, the IN had acquired two additional Sa'ar 4.5s plus Sa'ar 5s with deck and hangar. This gave the service five decks by 1995 that were little used. The Navy was finally able to procure five militarized Dauphins, AS.565MA Panthers, delivered in 1996-1997. The Panthers were equipped with a nose sensor package of search radar and FLIR, plus a unique kit of communications, navigation, and self-protection gear. The Sea Scans could relay data to the Panthers.[8]

In 2015, the Navy began the process of acquiring four Sa'ar 6 corvettes, each with a deck capable of accommodating a medium helicopter. At the same time, Israel received approval to purchase eight former US Navy SH-60F Seahawk helicopters to be delivered in 2021. These would be fitted with advanced systems for electronic data collection and other roles of a naval helicopter. The vessels would bolster the IN ability to protect the natural gas fields in the Mediterranean that were so important to the country's economy. They could replace the Panthers whose range and power were considered marginal, but this would leave smaller-deck vessels without helicopters.

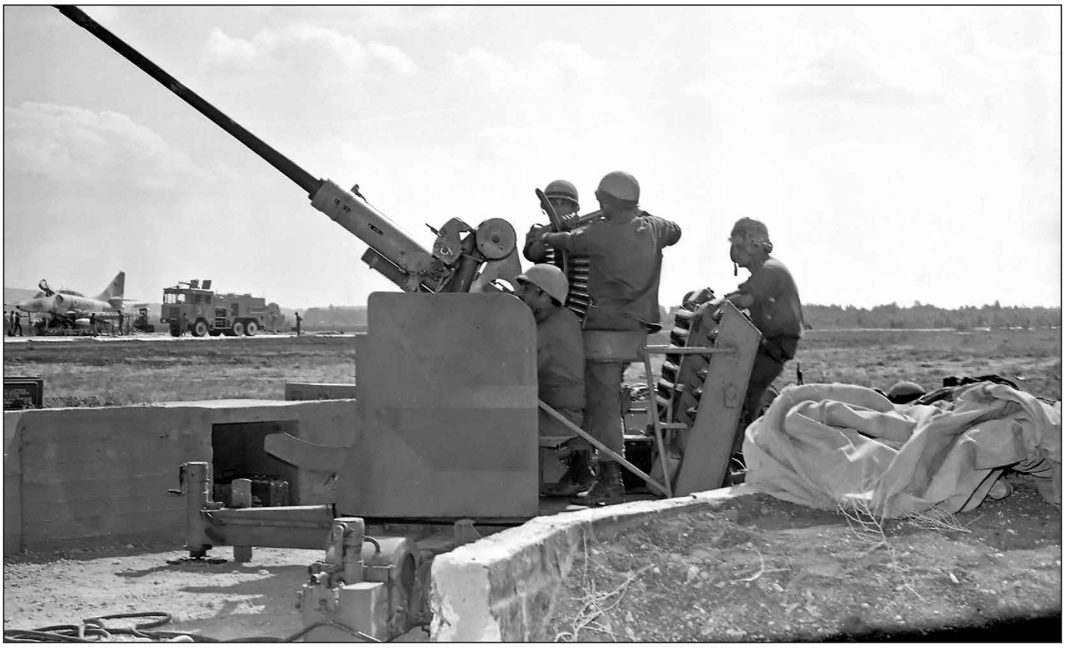
7

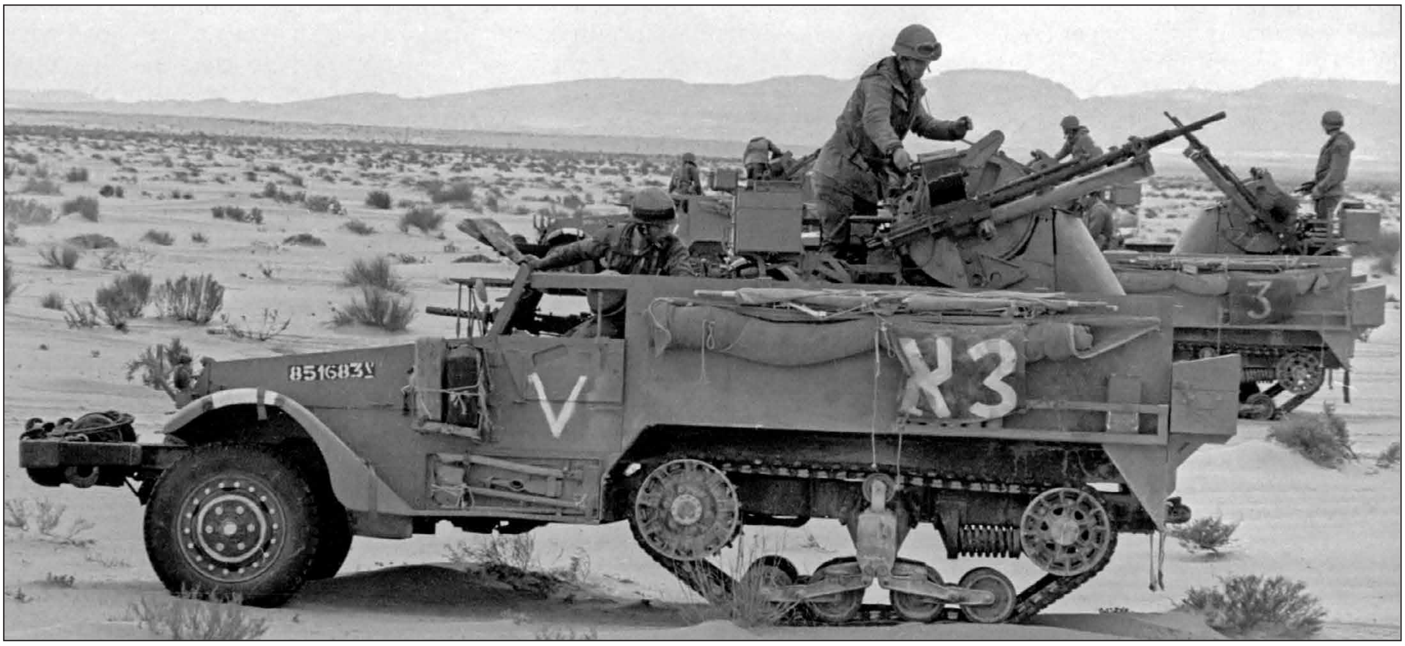
AIR DEFENSE FORCES

During the War of Independence, anti-aircraft guns and cannons were placed around some of the major air bases and other high-value facilities. These consisted principally of 20-mm and 0.50-cal weapons. On the first day of Israel's existence, this force scored their initial victory in bringing down an Egyptian Spitfire. They were ultimately credited with downing 33 aircraft during that war.[1] The first radar, placed on Mount Carmel, was assembled from scrap left by the RAF and so was unreliable.[2] Two others were short-range junk. These and telephone calls from observers were all the early warning the IAF had, and so intercepts were mostly by luck.

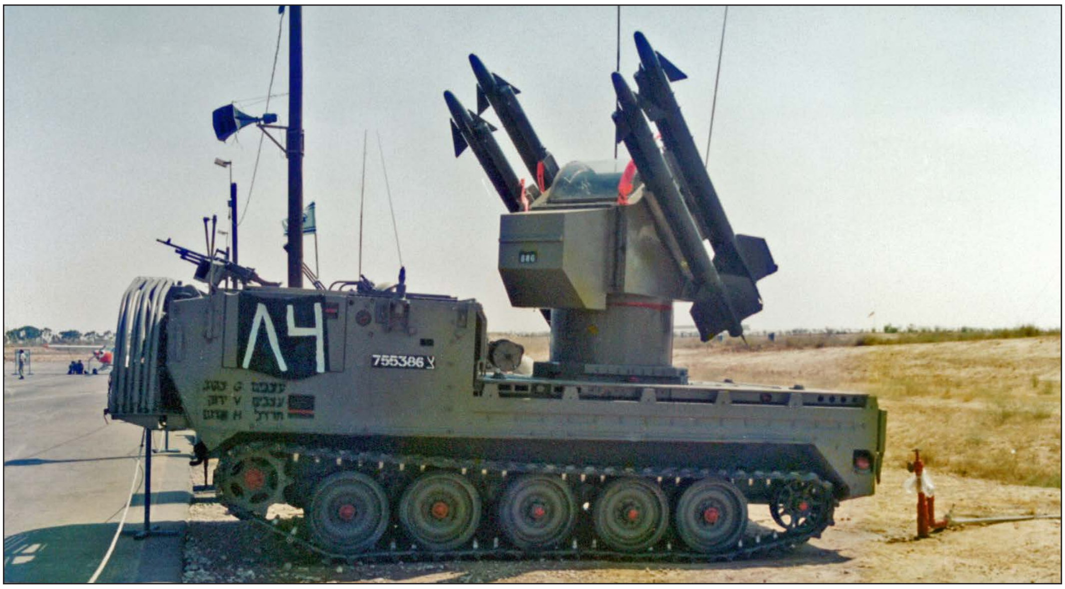
The Air Defense Forces (ADF), under Zahal headquarters command, was formally organized in January 1950. Two surplus American radar were adopted in 1951, one emplaced in Haifa and the other at Hatzor AB, to monitor aircraft movement over the country. However, with an average 75-mile (121-km) range, these were unsuitable for early warning of inbound bombers.[3] The service continued to employ observers and had a few barrage balloons. In 1956, the French supplied modern radar to substantially improve reaction time. As these were intended to assist in keeping the skies clear of enemy aircraft during mobilization and had to work in close concert with the IAF, they fell under Air Force auspices. The Anti-Aircraft Artillery regiments remained under the Artillery Corps, although subject to Air Force command and control (C^2).[4] For the 1956 war, the force consisted of 200 small-caliber cannon and just one battery of heavy AAA.[5]

Noteworthy of the defensive weapons the USA sold to Israel beginning in the mid-1960s were Hawk anti-aircraft missile batteries. The IAF opposed this diversion of funds, feeling that offense was superior to defense, but the wider government and public insisted. The radar-guided weapons, with 15-mile (24-km) range, were also a considerable level of complexity above the AAA


An Air Defense Forces 40-mm anti-aircraft gun is shown manned at Ramat David AB during the Yom Kippur War where an A-4H has taken the emergency barrier in the background. These types of long-standing weapons were operated by generations of Israeli draftees and reservists. (Ra'anan Weiss Collection)



The Israelis developed rotating twin-20-mm anti-aircraft gun turrets mounted on old American halftracks. These vehicles could move forward with advancing Army columns and provide defense from air attack in the absence of Air Force interceptors. This system served for more than 30 years. (IDF Spokesperson)



The IDF adopted the American MIM-72A/M48 Chaparral system for mobile air defense. This was a ground launched AIM-9D Sidewinder missile array on a tracked vehicle, as shown. The system served to 2003 and was credited with a Syrian MiG-17 shoot-down in May 1974. (BIAF – Israel Aerospace Magazine)

The Patriot was adopted after the Gulf War of 1991 when SCUDs fell on Israel. Apart from the anti-ballistic missile capability, it provided a superior anti-aircraft defense as well. Upgraded over the years, it was to be phased out as the Israeli-developed multi-layered defense systems came into the force. (Ofer Zidon Collection)

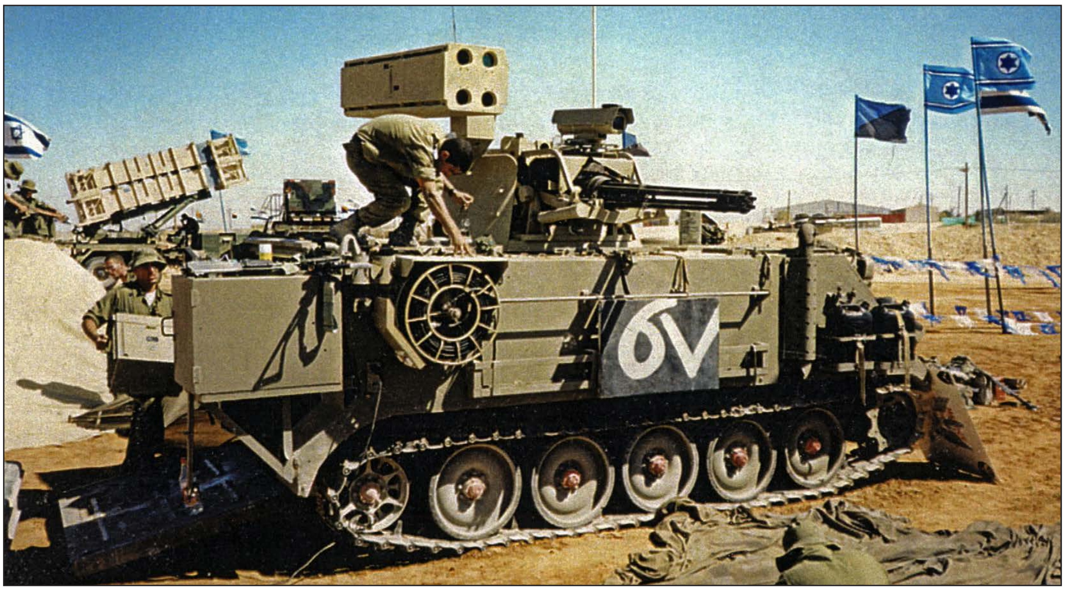
weapons theretofore employed by the anti-aircraft regiments. Consequently, the Hawk batteries fell under IAF operation.

Further equipment modernization yielded about 50 batteries of AAA by 1967, though all visually directed, with 40-mm, 30-mm, and 20-mm cannon. Some radar-directed 40-mm units were also acquired, supplementing the Hawk batteries. Much of the associated C^2 was under operational oversight of the Air Force because their radar had to be interoperable with air operations equipment, required necessary coordination with IAF flight schedules, and because many batteries were placed at air bases. During the Six-Day War, Zahal AAA brought down three enemy aircraft.

With the vast Sinai under Israeli occupation after June 1967, and the IAF still setting up basing for fighters at the former Egyptian airfields, it was prudent to position a Hawk battery at Bir Gifgafa – flown in aboard a Noratlas. Much more AAA assets were to follow. With Egyptian aircraft able to make hit-and-run attacks against Zahal forces arrayed along the Canal before IAF fighters could respond, local air defenses had to be beefed-up. The Israelis developed rotating quad-20-mm anti-aircraft gun turrets mounted on Soviet BTR APCs captured during the war.[6] In time the guns were also installed on old American halftracks. With greater integration of early warning and defense, it became advisable to move the Air Defense Forces under the IAF, and this was completed in 1970.[7] The ADF claimed 26 enemy aircraft during the War of Attrition, 12 to Hawk. The Hawk proved fairly effective, with the first kill coming on May 21, 1969, against an Egyptian MiG-21. By October 1973, the IAF possessed perhaps 100 AAA batteries (20 percent radar-directed) and 12 of Hawk. The Yom Kippur War brought the Force 55 more kills, 12 to Hawks, but with some of its personnel perishing in enemy airstrikes.

Up until the Yom Kippur War, the IDF had some of the halftrack-mounted twin 20-mm cannon as anti-aircraft assets embedded with mobile combat units. The war generated new thinking and the Chaparral missile plus Vulcan 20-mm Gatling gun tracked units were purchased in the late 1970s. Shoulder-fired Redeye missiles were also deployed, replaced later with Stingers. These elements were put to the test during the 1982 Operation Peace for Galilee in Lebanon. There a Vulcan brought down a MiG-21 and a Hawk helped in destroying a MiG-25. These systems were subjected to upgrades over the years, to include having a Stinger missile launcher added beside the Vulcan gun.

By 1990, the Scud missiles in Iraq and similar systems in Syria, Iran's development of very long range rockets, and medium range missiles under the control of Hezbollah in southern Lebanon, were all worrisome and growing threats. These began to display the accuracy to put most Israeli strategic assets at risk. If used at the beginning of a major war in attacking air bases, such weapons could have significantly hampered IAF operations. The impact could have been much graver if chemical or biological warheads were carried. Occasional firing of short-range rockets and mortar shells from Gaza and Lebanon were more active threats. The Iraqi



The M-163 with the 20-mm Vulcan Gatling gun was among the gear acquired after the Yom Kippur War to ensure defense of IDF ground forces while the Air Force was occupied. The addition of the pod of Stinger missiles began to be fielded in the 1990s. As with all IDF vehicles provided by foreign suppliers, Israeli modifications were commonplace. (Author's Collection)

Scuds falling on Israel during the Gulf War, and the poor results of the Patriots fired at those incoming missiles, brought greater focus on the ballistic missile threat. Patriot batteries were provided to Israel soon after the war and upgraded thereafter.

In 1986, Israel began an intensive effort to find solutions via a layered defense of suitable systems. These would fall under the Air Force's then-named Anti-Aircraft Command. However, none of the options had enthusiastic support of the IAF who felt that manned aircraft hitting missile launchers, even at great distance, was the best defense against such weapons. Again, the government responded to public demands and moved ahead with the long-term and costly effort. Over the next 30 years, the Americans would fund a majority of the development and production costs, approximately $6.5 billion, while insisting much of it be spent in the USA.[8]

One major element of the system, initiated in 1986, was to be the Arrow anti-ballistic missile system. This consisted of radar, battle management center, and hypersonic interceptor missiles, all movable. The Arrow 1 was a proof-of-concept missile with elements successfully exercised in 1992. The Arrow 2 was the production system for high altitude intercept and first tested in 1995. The Air Force supported development by launching large, high-speed targets off F-15s to simulate inbound ballistic missiles.

The Arrow 2 was deployed on a limited basis for emergency use in 1999, followed by the first fully operational battery in 2000. These and additional Patriot batteries were ready during the 2003 American invasion of Iraq during which, fortunately, no additional missiles were fired at Israel. The system was then upgraded repeatedly to increase capabilities. At least two batteries were emplaced at time of writing with a few hundred missiles in stock. The Arrow 3, under development since 2008, had an exo-atmospheric interceptor and went operational in 2017. Such systems were another element in the decision to change the IAF's name in 2005 to the Israel Air and Space Force.

The Improved Hawk, with a range of about 22 miles (35 km), and the PAC-3 Patriot of 37 to 39 miles (60 to 63 km), initially provided the middle of the layered air defense. For a more modern system, Israel developed David's Sling (initially known as Magic Wand) with a range of 155 miles (250 km) to intercept tactical ballistic missiles and aircraft, and possibly cruise missiles as a future capability. This was initial deployed in 2017.

As part of the Israeli-Palestinian Wye River agreement, the USA agreed to pay a major portion of the development costs for the lower tier system protecting Israel from short-range rockets, artillery shells, and mortar rounds fired from across the border. Land-based versions of the Phalanx 20-mm Gatling gun system were deployed along the northern border as an interim defense. Israel also worked with the USA on a tactical laser, though this was eventually set aside. The desired solution was the Iron Dome system of fairly inexpensive interceptor missiles, radar, and C^2 elements. It was first deployed in 2011 and proved immediately successful against Hamas rockets, ultimately shooting down hundreds of projectiles or ignoring those falling in uninhabited areas. In 2021, Israel was field-testing a ground-based laser air defense system and an airborne laser for shooting down drones. It had also deployed a ground-based multi-spectral surveillance system called Sky Spotter to detect even balloon- and kite-delivered munitions being sent across the border, but especially stealthy aircraft and missiles.[9]

At time of writing, there were still AAA batteries and the Army still had embedded anti-aircraft resources operated by the Air Force. In total, this "green" element of the IASF (referring to the olive drab uniform) had claimed approximately 85 enemy aircraft shot down, half by missiles.

The systems of missiles defending Israel from foreign threats was reason in 2011 to rename the force as the Air Defense Command, headquartered in Tel Aviv at the Kiryah. It had Northern, Central, and Southern Air Defense Regiments with an Air Defense Forces School (later Air Defense Academy) in Herzliya. A major installation in the Negev, near Mash'abei Sadeh, was built to accommodate forces withdrawn from the Sinai during the late 1970s.

APPENDIX I: AIRCRAFT SUMMARY

This listing attempts to enumerate all the more than 3,500 aircraft in regular operational service with the Israeli Air Force during its 75-year history (neglecting those temporarily mobilized, borrowed, or seized for emergencies). It is divided by primary role with each grouping ordered by date of service entry so as to permit the evolution of such aircraft in IAF service to be appreciated. Secondary roles are noted in the Comments column. Where no end year is indicated this signifies that the aircraft remained in service at date of publication. The number of UAVs of an individual model to have served is difficult to assess from open literature given that they were manufactured over many years and attrition losses were replaced somewhat regularly. Those UAVs operated under contract and by army tactical units are not reflected.

del. = delivery underway at time of writing

MAKE AND TYPE	MODELS	NO.	YEARS	COMMENTS
FIGHTER/FIGHTER-BOMBER				
Avia S-199		24	1948-49	also recce
Supermarine Spitfire	Mk.IXc, IXe	85	1948-56	also recce and training
North American P-51 Mustang	D	74	1948-61	also recce and training
de Havilland DH-98 Mosquito	FB.6, T.3, PR.16, NF.30, FR.9, TR.33	87	1948-58	also recce
Bristol Beaufighter	TF.10	4	1948-50	
Gloster/Armstrong-Whitworth Meteor	F.8, T.7, FR.9, NF.13, T.7/8	35	1953-70	also recce and training, night-fighter
Dassault MD.450 Ouragan	A, B	71	1955-73	also training
Dassault Mystère IVA		61	1956-71	also recce
Dassault Super Mystère B2		46	1958-75	27 re-engined to Sa'ar standard
Dassault Mirage III	CJ, CJ(R), BJ	76	1962-82	also recce, upgraded to Shahak
McDonnell Douglas A-4 Skyhawk	E, F, H, T/H, T/J, N	355	1967-16	also training, upgraded to Ahit
McDonnell Douglas F-4 Phantom II	E, R/C, R/E, E(S)	216	1969-04	also recce, upgraded to Kurnass
Israel Aircraft Industries Nesher	S, T	61	1971-85	built from French Mirage 5J assemblies
Israel Aircraft Industries Kfir	baseline, C-2, C-7, TC-2	212	1975-95	also recce
McDonnell Douglas / Boeing F-15 Eagle	A, B, C. D, I	117	1976-	also recce, upgraded to Baz
General Dynamics / Lockheed F-16 Fighting Falcon	A, B, C, D, I	362	1980-	also training and recce
Lockheed Martin F-35 Lightning II	I	50 del.	2016-	more planned
ATTACK HELICOPTER				
Bell AH-1 Huey Cobra	E, F, G, Q, S	68	1975-14	also training, upgraded, does not count those acquired for parts
Hughes / McDonnell Douglas Defender	500MD, MD500	36	1979-96	also training, six unarmed MD500
McDonnell Douglas / Boeing AH-64 Apache	A, D	60	1990-	some upgraded
BOMBER				
Lockheed Hudson	Mk.III, IV	3 or 4	1948-54	restored from transport
Boeing B-17 Flying Fortress	G	3	1948-57	also maritime patrol
Sud-Aviation Vautour II	A, B, N	31	1957-72	also recce, EW
HEAVY TRANSPORT				
Curtiss C-46 Commando	A, D	12	1947-52	also improvised attack
Douglas C-54 Skymaster	A, B	2	1948-49	
Lockheed C-69 Constellation		1	1948-49	
Douglas C-47 Dakota	A, B	40?	1948-01	also improvised attack, EW, training
Nord-Aviation N.2501 Noratlas	IS, D	24	1956-78	also improvised attack, recce, EW, tanker
Boeing 377 Stratocruiser		5	1962-75	transport, modified
Boeing KC-97 Stratofreighter	F, G	9	1965-78	also recce, EW, tanker, modified
Lockheed C-130 Hercules	E, H, E/H K/H, J-30	33	1971-	upgraded
Boeing 707	-100, -300 series	30-35	1973-	also EW and tanker
Boeing KC-46 Pegasus	A (2, option for 6 more)	ordered	2023?	tanker-transport
MEDIUM TRANSPORT				
de Havilland DH-89 Dragon Rapide	A	12	1947-56	also improvised attack, ambulance
Douglas DC-5		1	1948-49	
Miles M.57 Aerovan	4	1	1948	
Lockheed Lodestar	L14, C-60A	1 or 2	1948-50	
Fairchild F-24 Argus	R	4-5	1948-50	also improvised attack

MAKE AND TYPE	**MODELS**	**NO.**	**YEARS**	**COMMENTS**
Noorduyn C-64 Norseman	A	7	1948-54	also improvised attack
Beech D-18S Expediter	converted TC-45G	2	1960-62	navigator training
Israel Aircraft Industries Westwind	1121, 1123	7	1973-80	executive
Britten-Norman Islander BN-2A	Series 1, 2	2	1973-82	
Israel Aircraft Industries Arava	101, 201, 202	14-15	1982-04	also training, 202s EW
Beech / Raytheon B200 Super King Air	baseline, C, T, CT	23	1991-	also observation and training
ASSAULT HELICOPTER				
Sikorsky S-55		2	1956-63	also SAR, as with all of these
Sikorsky S-58 and H-34 Choctaw	58B, 34A, G.III	31	1958-68	
Sud-Aviation SA.321K Super Frelon	a, b	14	1966-91	also EW, 10 or less re-engined
Bell/Agusta-Bell 205	205A, UH-1D, UH-1H	51	1968-78	also training and EW
Sikorsky S-65 and CH-53 Sea Stallion/King Stallion	65C-3, 65-Öe, 53A, K (on order)	55	1969-	also EW, some reworked to Yas'ur, 13 more as spares sources
Bell/Agusta-Bell 212		58	1975-02	also training
Sikorsky Black Hawk	S-70, UH-60A, L	49	1994-	also training
LIGHT TRANSPORT/LIAISON				
R.W.D.-13		2	1947-48	also improvised attack
de Havilland DH-82 Tiger Moth	C	2	1947-48	also training
Taylorcraft	A, BL	3	1947-49	also improvised attack
Auster Autocrat	J/1	1	1947-51?	also improvised attack
SNCAN/Nord Norécrin II	1203	2	1948-49	also ambulance
Miles Gemini	1A	1	1948-49	government (no IAF markings)
Grumman Widgeon	A	2	1948-49	amphibian
Auster AOP	.3, .5	20	1948-52	also improvised attack
Republic Seabee	RC-3	1	1948-53	amphibian
Beech Bonanza	A35	4	1948-53	also improvised attack
Piper PA-11 Cub	-90	20	1948-60	also attack and training
Hiller 360		2	1951-59	helicopter
Dornier Do.27	A, B, Q	34	1964-82	also observation
Hiller UH-12	E4	1	1967-76	helicopter, captured and operated
Cessna C-180 Skyhawk	D, F	2	1967-82	
Piper PA-18 Super Cub	-95, -150	120?	1956-03	also training
Piper PA-20 Pacer	-125	1	1959-65	
Piper PA-22 Tri-Pacer	-160	1	1959-65	
Pilatus PC-6 Turbo-Porter	A	2	1963-73	
SOCATA MS-892 Rallye Commodore 150	A	1	1965-73	
Cessna U206 Super Skywagon and Stationair	C, D, E, G	36	1968-97	
Piaggio P.149	U	3	1968-73	
Dornier Do.28	B1	25	1971-05	also patrol and observation
Bell 206 JetRanger and OH-58 Kiowa	206A & B, 58B	42	1971-	helicopter, also training
Cessna T-41 Mescalero	D	2	1974-79	also training
Beech Queen Air	B80	12	1974-03	also training
Bell 206L Long Ranger III	206L-3	6	1984-03	helicopter, also training
SOCATA TB20 Trinidad		22	1995-05	
Beechcraft Bonanza	A36	24	2004-	also observation
TRAINING (PRINCIPAL ROLE)				
Vultee BT-13 Valiant		2	1948-49	little used
Boeing-Stearman Kaydet	PT-17	55?	1948-62	also improvised attack
North American AT-6 Harvard	A, D, II	80?	1948-63	also light attack
Avro Anson	Mk. I, X	9	1948-56	also transport
Airspeed Consul		11	1949-56	also transport
Airspeed Oxford		5	1951-57	also transport

MAKE AND TYPE	**MODELS**	**NO.**	**YEARS**	**COMMENTS**
de Havilland of Canada DHC-1 Chipmunk	B-2	1	1949-54	evaluated for primary
Fokker S.11 Instructor		41	1949-56	primary, some not used
Temco Buckaroo	T-35A	1	1950-54	evaluated for basic
Fouga CM.170 Magister		150	1957-10	also light attack, upgraded to Tzukit
Sud-Aviation Alouette II	SE 313B, C	15	1957-82	helicopter, also liaison, break 75-77
Bell/Agusta-Bell 47	G, G-2	13	1965-68	helicopter, also liaison
Grob G 120	A-1	17	2002-	screening
Beechcraft T-6 Texan II	A	20	2009-	basic
Alenia Aermacchi M-346		30	2014-	advanced
Leonardo AW119	Kx	12	2020-	helicopter
TRAINING (YOUTH)				
Slingsby Tutor	T.41	2	1955-60s	glider, youth training
Slingsby Prefect	T.30B	2-4	1960s	glider, youth training
Slingsby Skylark 2	T.31B	11	1960s	glider, youth training
MARITIME				
Consolidated PBY-5 Catalina	A	3	1952-56	patrol
Israel Aircraft Industries Sea Scan	1124N	3	1979-17	patrol, from Westwinds (above)
Aérospatiale Dauphin	HH-65	2	1985-97	shipboard helicopter
Aérospatiale AS.565 Panther	MA	5	1996-	shipboard helicopter, OTH targeting
Israel Aircraft Industries Heron 1		4	2017-	patrol, replaced Sea Scan
Sikorsky SH-60	F	8	2021 del.	shipboard helo, replacing AS.565
ELECTRONIC WARFARE (PRINCIPAL ROLE)				
Grumman OV-1 Mohawk	D	2	1974-82	SIGINT and geolocation
Grumman E-2 Hawkeye	C	4	1978-94	AEW
Beech / Raytheon RC-12 Guardrail	D, K	7	1984-	SIGINT
Gulfstream G.V (Shavit)		3	2005-	SIGINT
Gulfstream G-550 (Eitam)	third is Oron configuration	3	2006-	AEW
FIRE-BOMBER				
Air Tractor AT802	F, Fireboss	7	2011-16	firefighting, to police
SURVEILLANCE – UNMANNED AIRPLANE				
Teledyne Ryan Firebee	124I	24	1971-95?	also decoy
Ford Aerospace Prairie	IIB	2	1977-81?	to gain exposure
Tadiran Mastiff	I, II, III	350?	1978-90?	mostly Army Intelligence
Israel Aircraft Industries Scout	II	108?	1981-96?	
Israel Aircraft Industries Searcher	I, II	200?	1992-05?	
Silver Arrow / Elbit Hermes	450S	?	2002-	also EW
Israel Aircraft Industries Heron		?	2007-	also EW
Israel Aircraft Industries Heron TP ‘Eitan’		7?	2010-	also EW
Elbit Hermes	900	?	2014-	also EW
SURVEILLANCE – UNMANNED AEROSTAT				
Rafael Stratus Aerostat		?	1979- ?	
Rafael Observation Balloon System		?	1990-	
TCOM LASS	71M, Mk VII-S	?	1980s- ?	observation
Top Eye View		?	2010s- ?	
DECOY/TARGET (UNMANNED)				
Northrop Chukar I	MQM-74A	203+?	1971-95?	also reconnaissance
Teledyne Ryan Firebee	Model 232 BQM-34, 147T	24?	1974-95?	
Beech/Raytheon AQM-37	Model 1098	20-45	?	target only
OTHER				
MiG MiG-21	F-13	1	1966-68	defection, operated
Israel Aircraft Industries Lavi	B	3	1987-98?	developmental

APPENDIX II: GALLERY

What follows are images depicting the aircraft summarized in the previous appendix.

FIGHTER/FIGHTER-BOMBER

The two dozen Avia S-199s acquired from Czechoslovakia in 1948 were problematic machines. Most were lost to mishaps and the type was set aside as soon as other fighters became available. However, in their short period of service, they were vital during air combat during the early period of the War of Independence. (Yoav Efrati Collection)

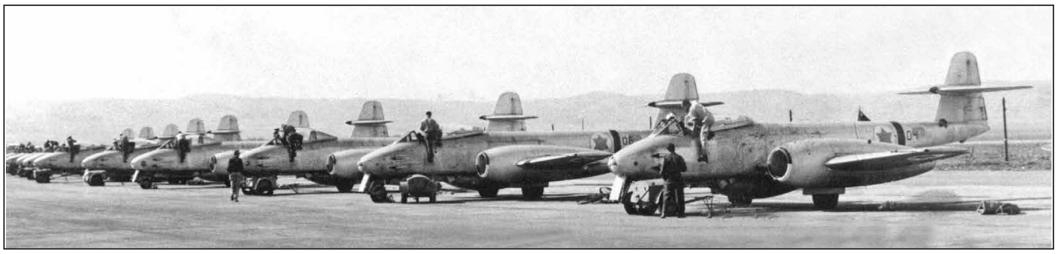
The Israelis sought Spitfires from the first but acquired meaningful numbers only late in the War of Independence. A total of 85 eventually served for nearly a decade as a frontline fighter, trainer, and photo reconnaissance platform. (BIAF – Israel Aerospace Magazine)

The P-51's career with the IAF was longer, and in greater numbers than the Spitfires, but similar in many respects. It served long enough to see combat in the 1956 war. Aircraft 53 bears the tail markings of 101 Squadron. (Author's Collection)

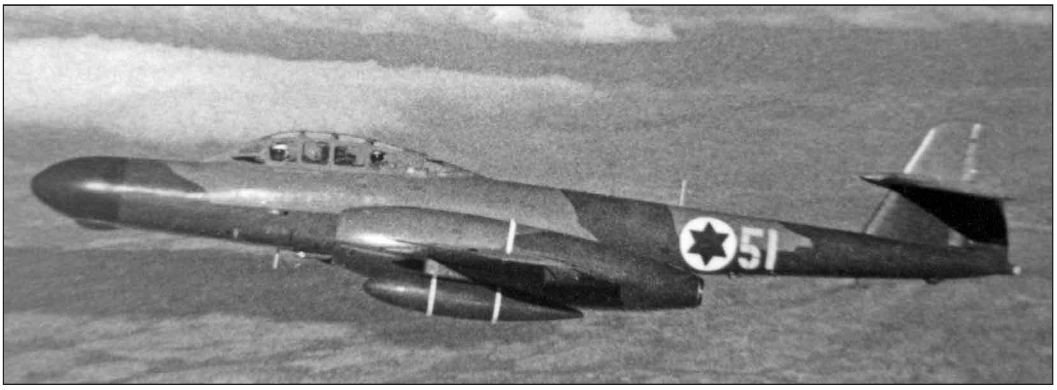
The poorly funded IAF of the early 1950s had to buy used aircraft – little else was available – and the de Havilland Mosquito offered good utility with speed, range, and firepower. The FB.6 model, like that shown, was bought in the greatest numbers and equipped two squadrons. Serviceability was poor, accident rates discouraging, and the Hatzor-based units felt like second-string elements. (Author's Collection)

Israel bought various other models of Mosquito to gain additional mission capabilities. This included long-range reconnaissance and night fighting, though the latter was never fully realized. This image is of a TR.33 armed up for a mission during the Sinai Campaign, the Mossies' last duty in IAF service. (BIAF – Israel Aerospace Magazine)

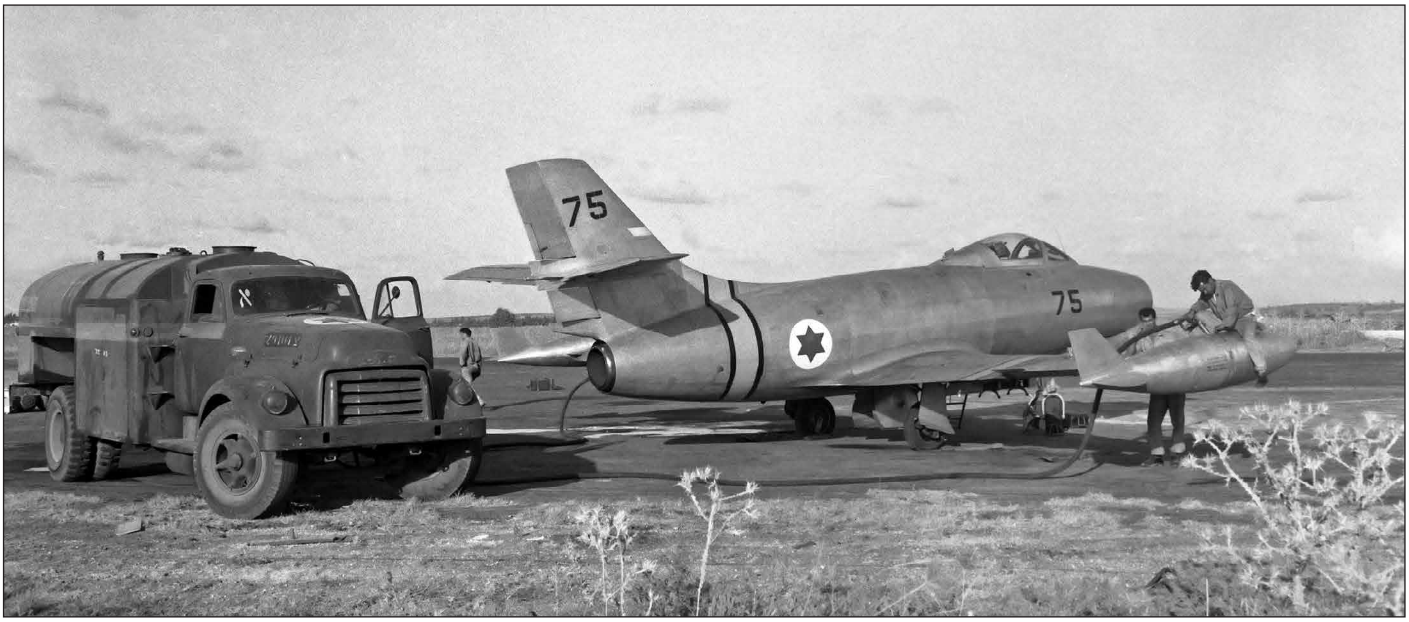
Three Beaufighters were smuggled to Israel via creative and illegal means, but once in country serviceability proved extremely bad. One was damaged on its first Israeli flight and cannibalized to keep the others flying. The pair executed only a few combat missions, one in which the squadron commander and two others were killed. The last was struck off charge in 1950 after a year grounded. (BIAF – Israel Aerospace Magazine)



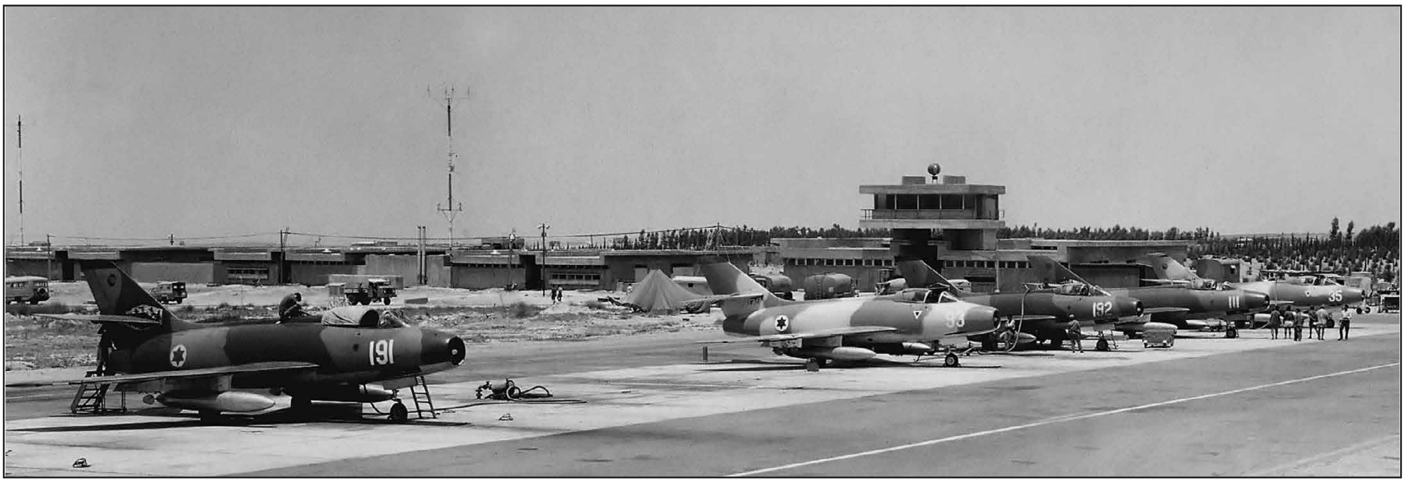
After much effort, Israel finally acquired jets in 1953, though outdated Meteors. The F.8 made up most of the early models and filled a new squadron. These 117 Squadron F.8s are shown at Ramat David during the Sinai Campaign. (Amos Dor Collection)



Of the various models of Meteor acquired by the IAF, to include trainers, the NF.13s were the first true night fighter. The capability was barely ready in time for the Suez Campaign and was used to secretly down an Egyptian transport, with senior staff personnel and civilians aboard, in international airspace. The NF.13s were quickly eclipsed by Vautour night fighters and so turned to training. (Shlomo Aloni Collection)

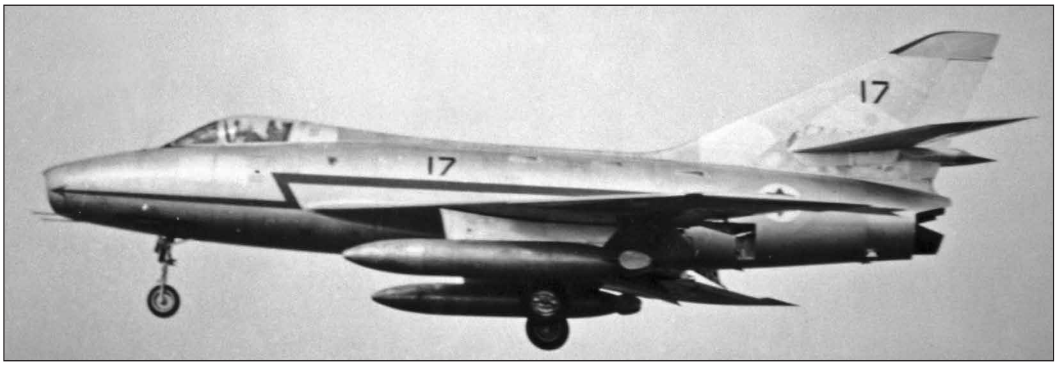


When France first began selling combat aircraft to Israel, the Dassault Ouragan was readily available. Although quickly outclassed by opposition fighters, the Ouragan was rugged, reliable, and useful in ground attack. Bought in large numbers, it served during three wars and also performed as an operational trainer. This image dates from November 7, 1956, with the aircraft wearing the wartime “invasion stripes.” (Ra’anan Weiss Collection)

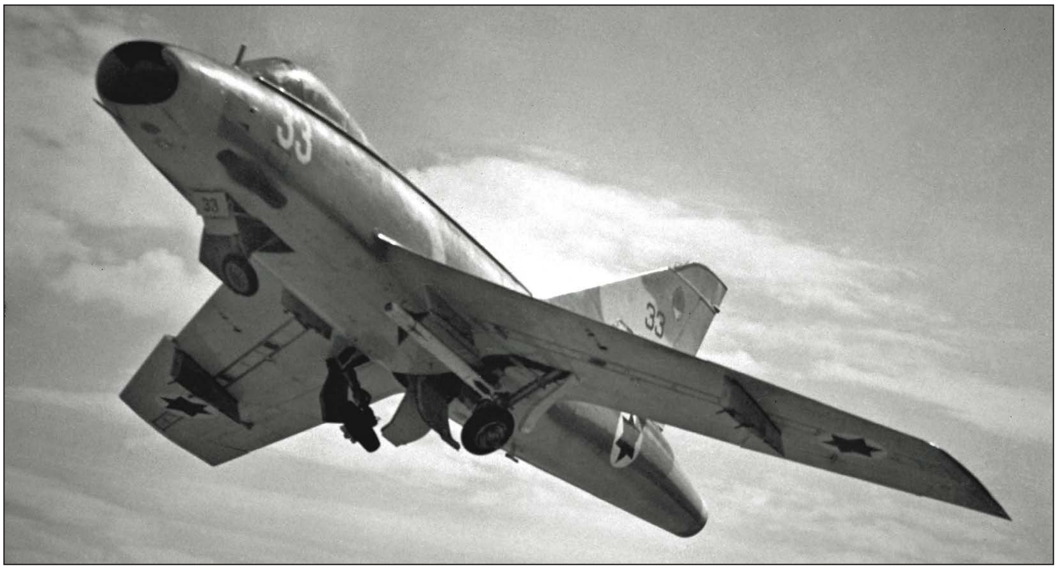


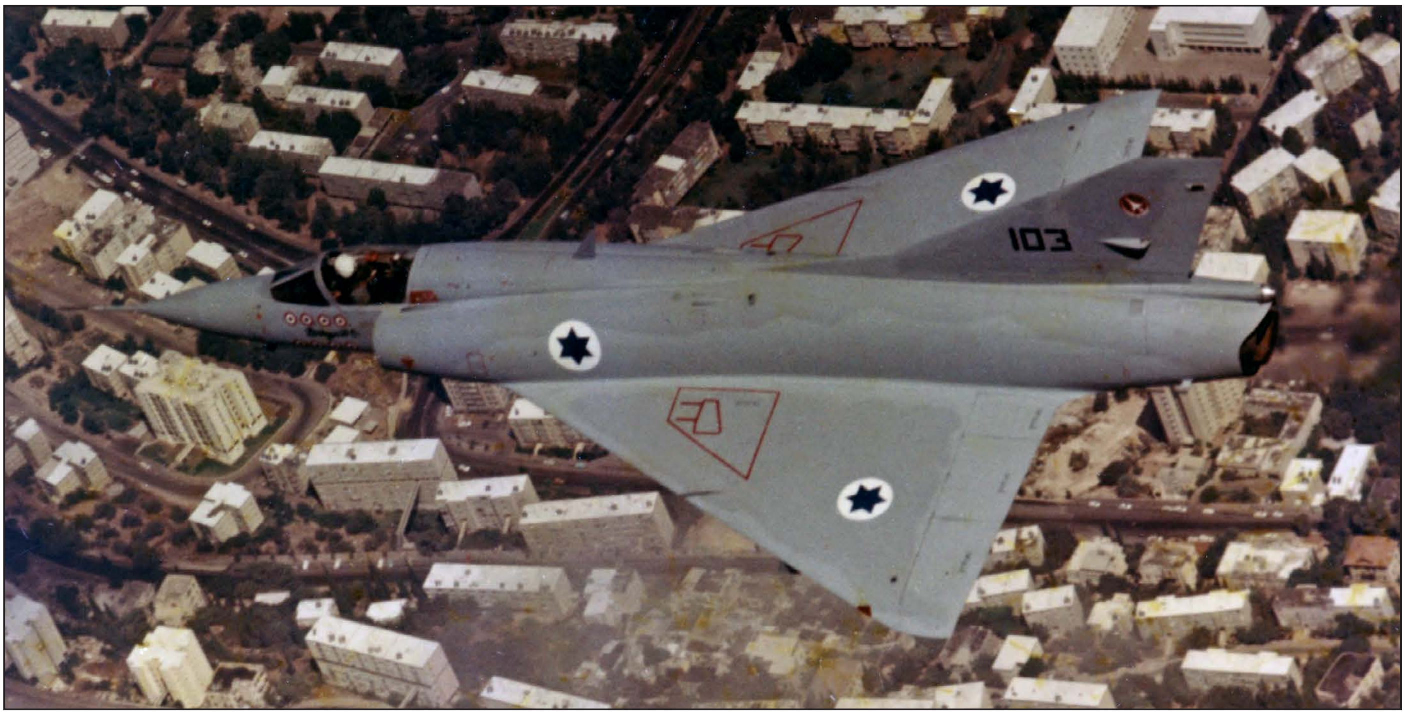
The swept-wing Mystère IVA was a competitive fighter that was barely operational with the IAF when the Suez Campaign was launched. The 101 Squadron “MIVAs” (one shown here) accounted for all kills during that war, and a few in 1967 with other units. It contributed respectfully in the air-to-ground role until retired in 1971. This image from 1968 shows 116 Squadron “MIVAs” at the newly built Hatzerim AB with the aircraft a mix of old and new paint schemes, the former with an added “1” as a prefix to the aircraft number. (Ra’anan Weiss Collection)

The supersonic Super Mystère B2 (here landing at Hatzor) was a marked improvement on its predecessor, but only one squadron took up the type given the advent of the Mirage. Their good range and combat load allowed them to effectively strike air bases deep in Egypt during the Six-Day War. They also scored air-to-air during that brief conflict. (Ofer Zidon Collection)

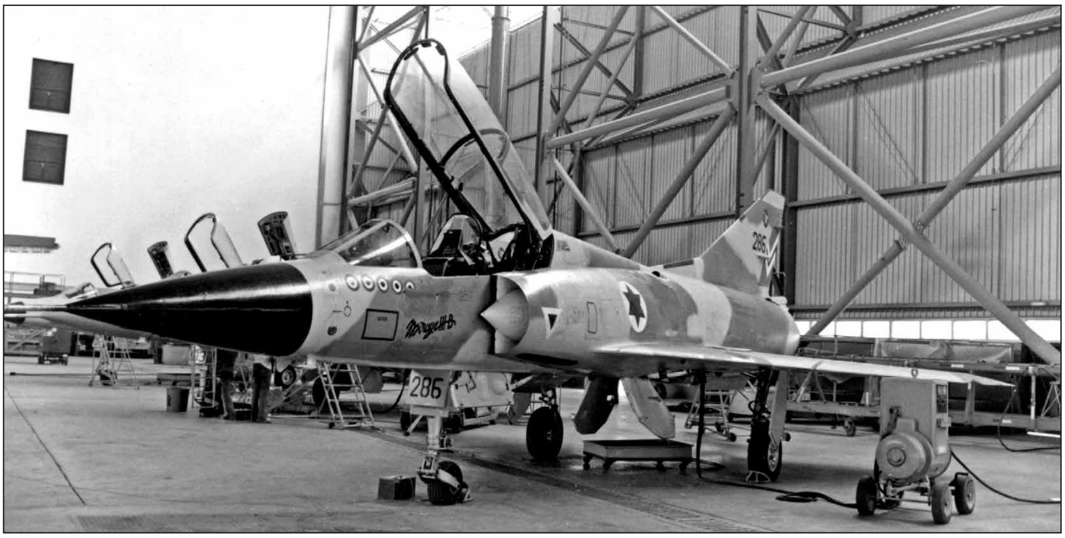


Given the high cost and delivery terms of American warplanes, it was economical to extend the service of the Super Mystère. Modifications by Israel Aircraft Industries to install the J52 engine, air-to-air missiles, and additional weapon stations yielded the Sa'ar – note the extended aft fuselage and Shafrir round at the port wing root. These airplanes contributed during the Yom Kippur War, but were withdrawn in 1975. (Shlomo Aloni Collection)

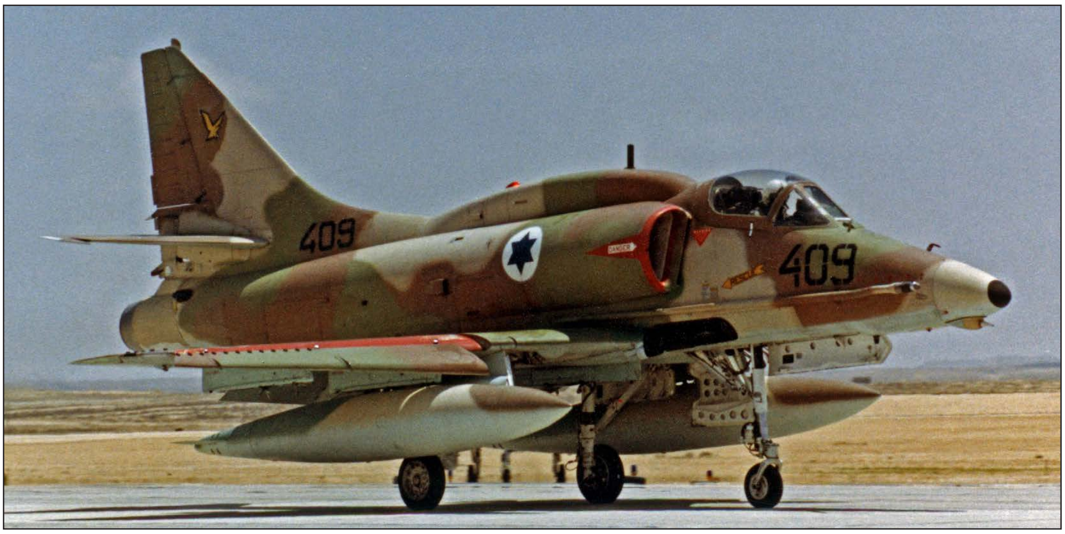




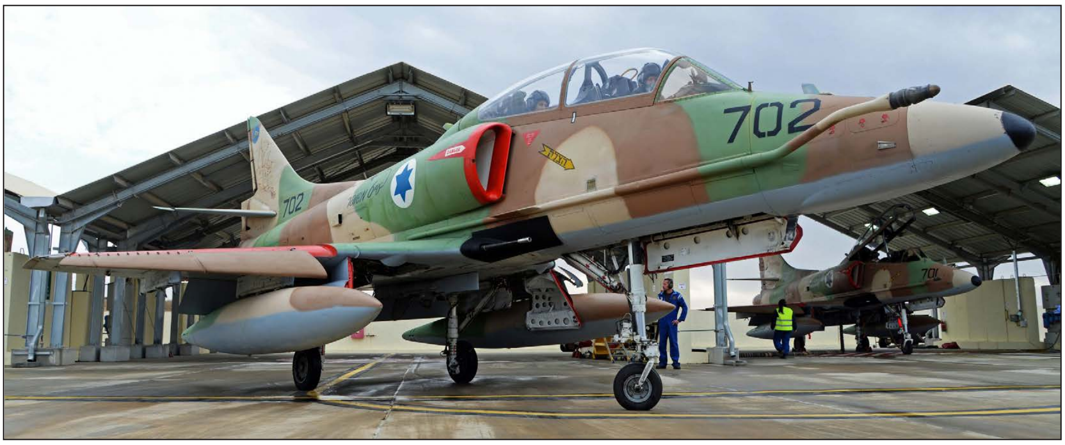
The arrow-like delta-wing Mirage IIICJ was symbolic of the IAF and its resounding success during the Six-Day War. The type continued to contribute air-to-air into the Yom Kippur War. This 117 Squadron machine is finished in the 2-tone gray camouflage for its last period of service (one of only four so-finished) yet has not been modified with the Atar 09C engine. (Ra'anan Weiss Collection)



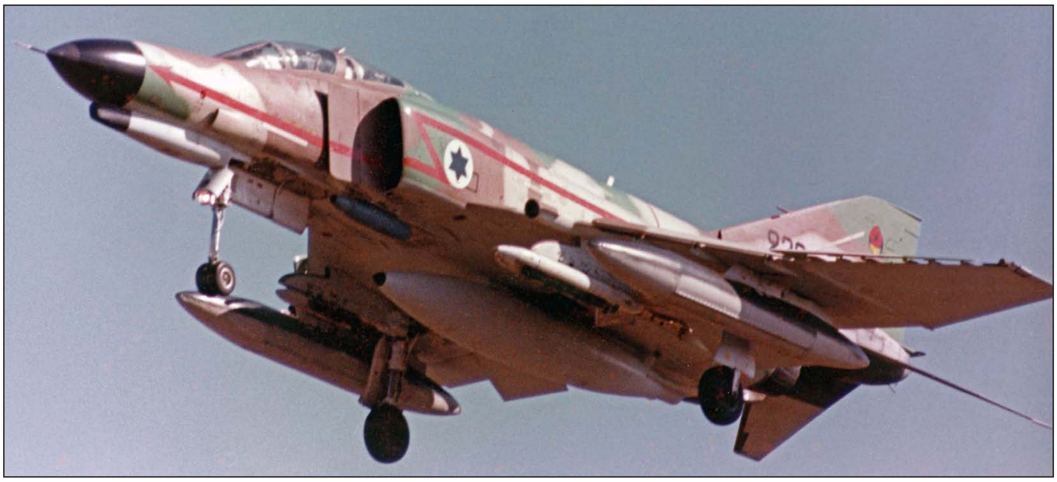
Two-seat fighters intended for training were keep in a combat-ready state by the IAF and did see combat. This applied to 253 Squadron's Mirage IIIB 286 shown that collected kills during the Yom Kippur War. Their greater roles were in training and test. (BIAF – Israel Aerospace Magazine)



The A-4 Skyhawk was the first combat aircraft provided by the USA, who eventually delivered 355 to become the most numerous aircraft in IAF history. From initial arrival in December 1967, the type served through 2016 in several models. This late-service A-4N of 140 Squadron displays several Israeli modifications including the extended tailpipe. (BIAF – Israel Aerospace Magazine

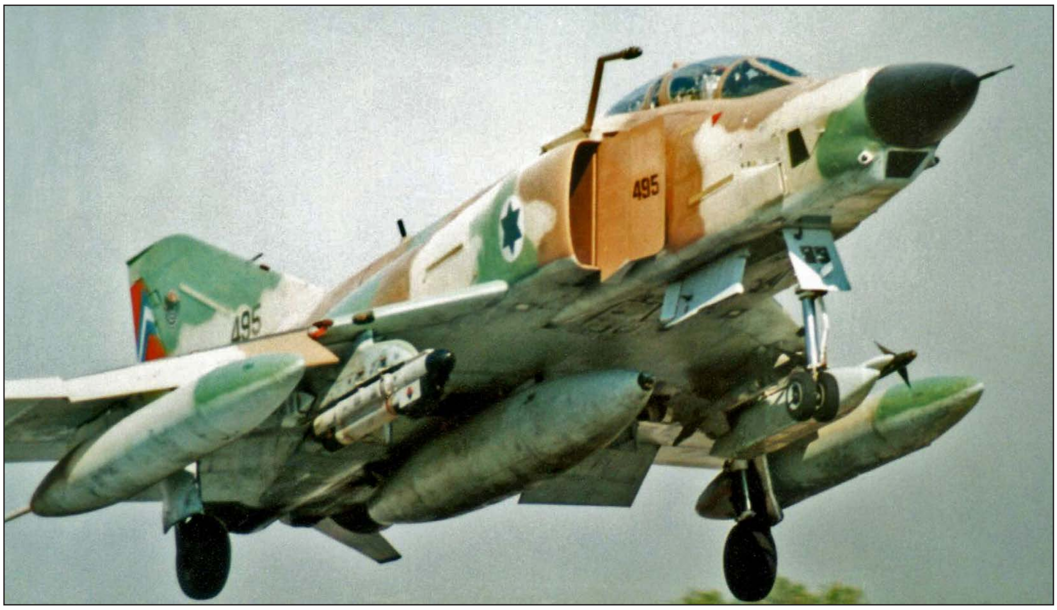


Two-seat Skyhawks were essential training assets from the first, but also permitted backseat observers that aided in attack coordination or spotting threats. The type's final role was as an advanced trainer. This 102 Squadron TA-4 is seen at Hatzerim AB during its final year of service. (Israeli Air Force)

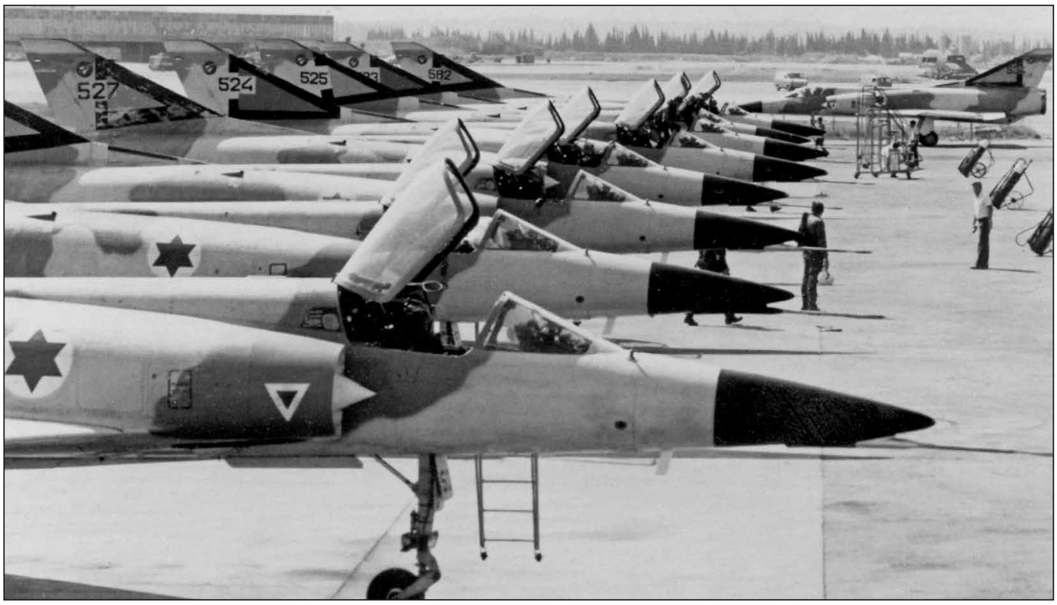


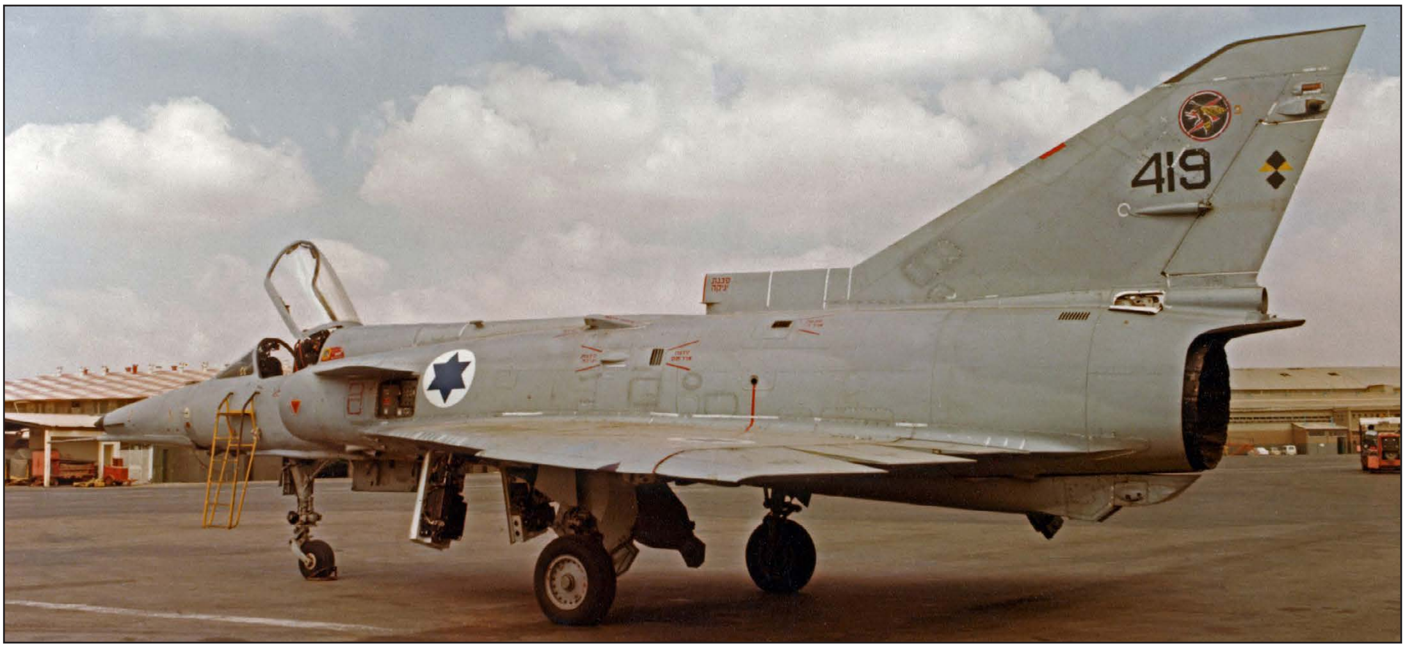
Israel worked tirelessly to convince the Americans to provide F-4E Phantoms, and these soon became the premier heavy strike jet for many years. It eventually led the IAF to adopt two-seat jets as the principal configuration for complex attacks. This 105 Squadron machine has an electro-optical camera in the port wing leading edge and an inert bomb in the forward/port side Sparrow cavity (likely for ballast). (Ed Okun Collection)

A vital role for the high-performing Phantom was as a photo reconnaissance platform. A handful of RF-4Es (like this 201 Squadron example equipped with a jamming pod and high-volume chaff dispenser) were acquired and other F-4Es modified for the role. Their importance through the 1970s and 1980s cannot be overstated. (Ofer Zidon Collection)

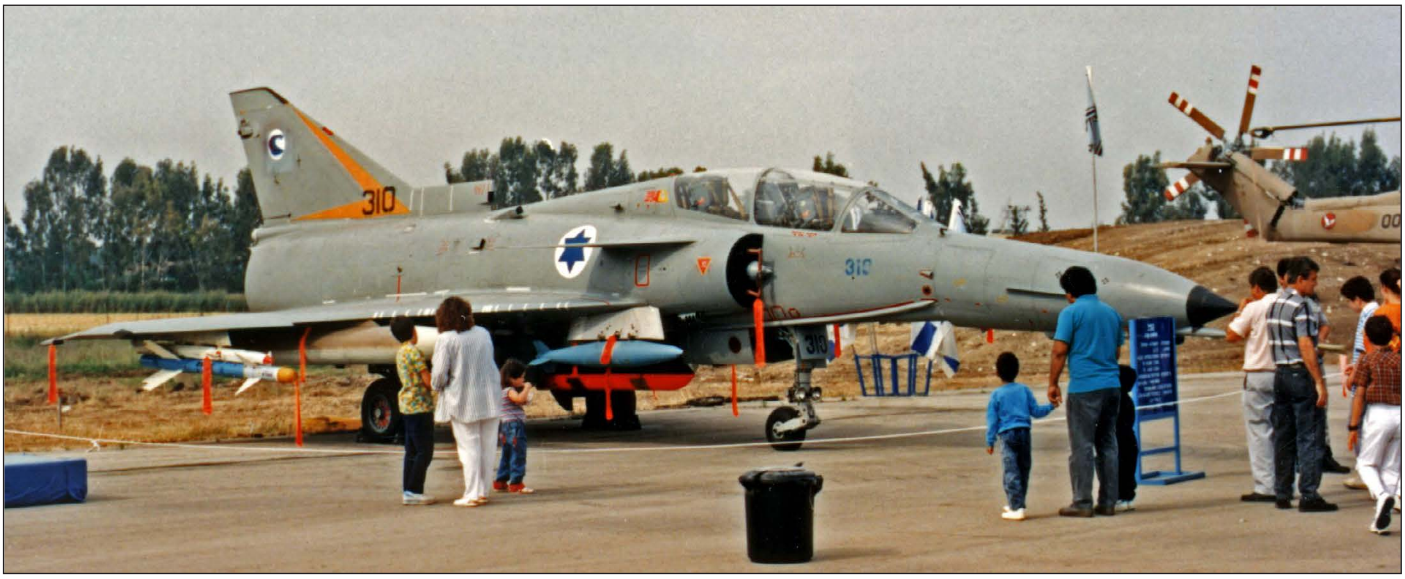


The Nesher was the Mirage 5, which France had developed for Israel and then ostensibly embargoed, assembled by Israel Aircraft Industries. The subterfuge behind this endeavor is noteworthy, but the combat contribution of the Nesher, beside the earlier Mirage IIICs, was tremendous. The jets (253 Squadron machines pictured) routinely carried AIM-9 missiles beside the indigenous Shafrirs during the type's heyday. (Author's Collection)

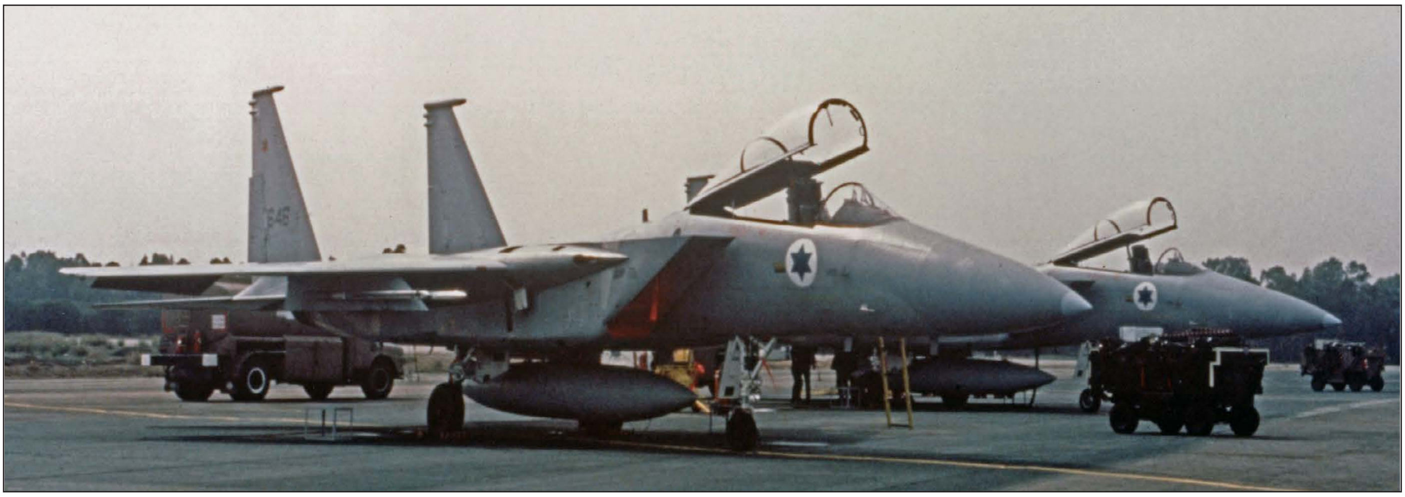




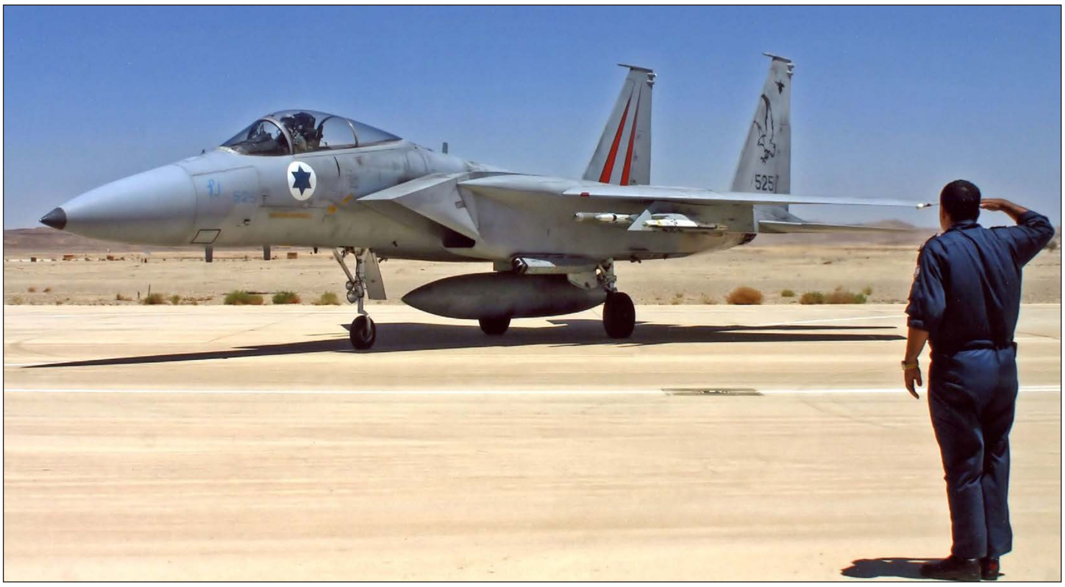
With the assistance of American firms, Israel Aircraft Industries adapted the Mirage airframe to accept the J79 engine and features enhancing the air-to-ground mission. The Kfir soon converged on the relatively successful C2 configuration like the 113 Squadron example shown here. Already a second-tier fighter-bomber when introduced, the IAF operated 212 Kfirs in four models over 20 years. BIAF – Israel Aerospace Magazine)



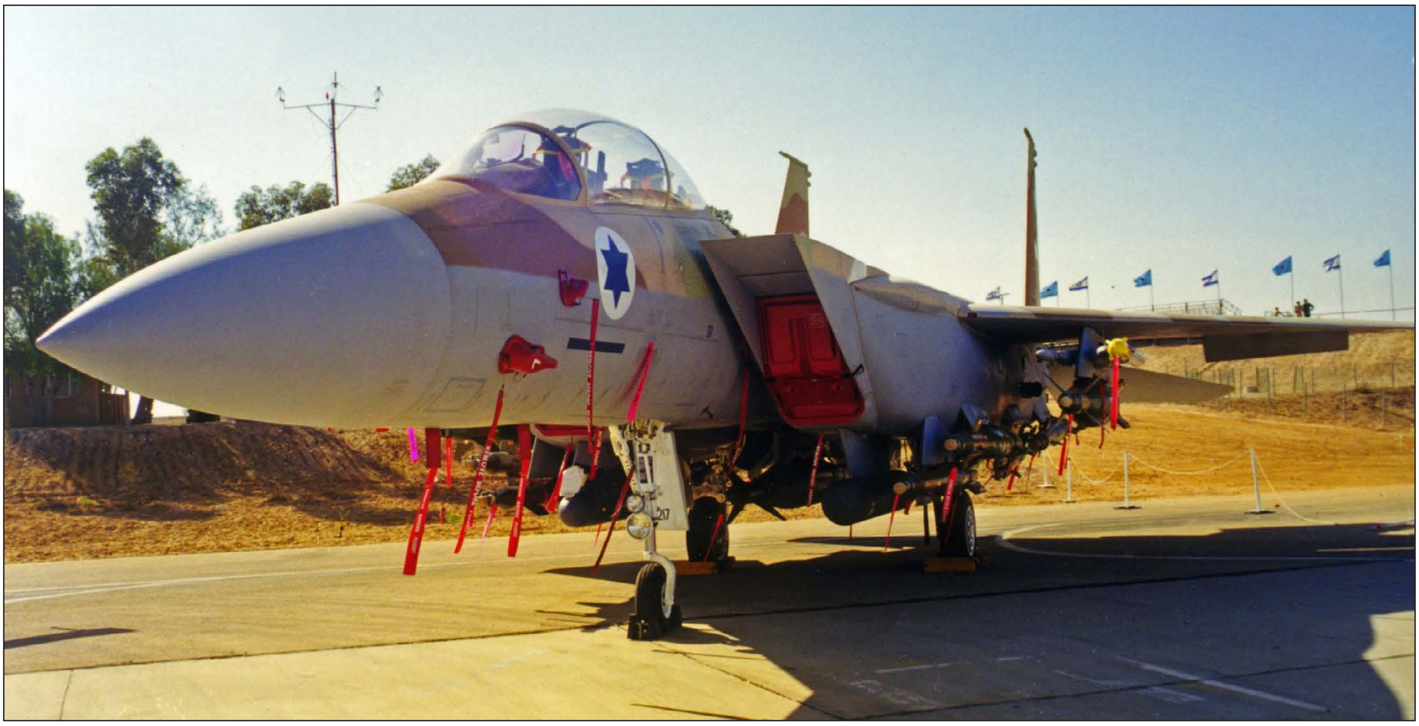
By the late 1970s the Nesher two-seater trainers were set to be sold and the Mirage IIIBJs were close to retirement. Yet, with six squadrons of Kfirs expected, the need for a delta-winged trainer remained. So, IAI built ten Kfir TC2s like this flight test example with a false squadron badge, the nose drooped to give both pilots suitable vision during landing approach. (Author's Collection)



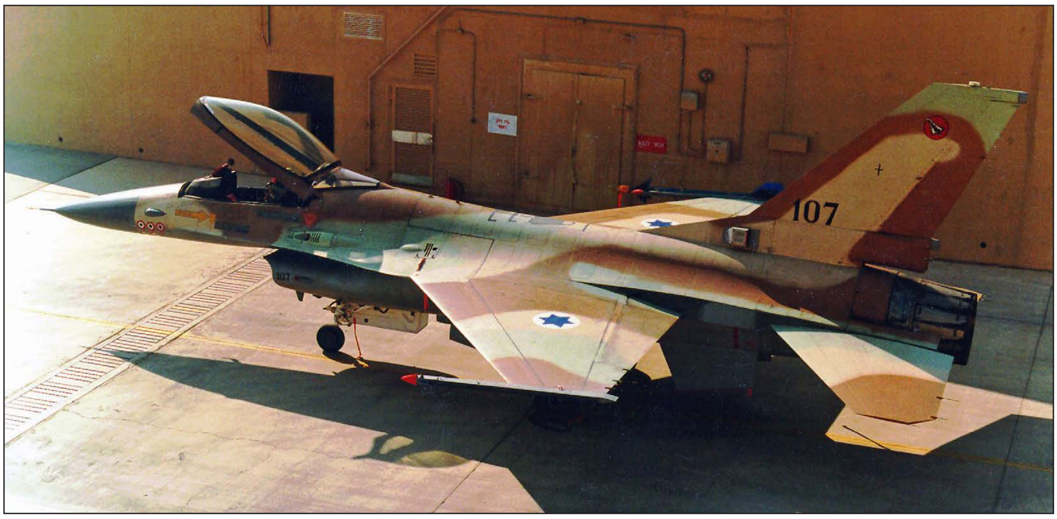
Two of the initial four F-15As display the 133 Squadron badge on their tails. These four aircraft, developmental airframes, preceded the others in the order by nearly a year, with just five pilots, giving much-needed air defense capabilities. The IAF would take 44 F-15As and 7 F-15Bs (a 133 Squadron A shown with American weapons) and they served for decades, introducing the type to combat. (Israeli Air Force via Lon Nordeen)



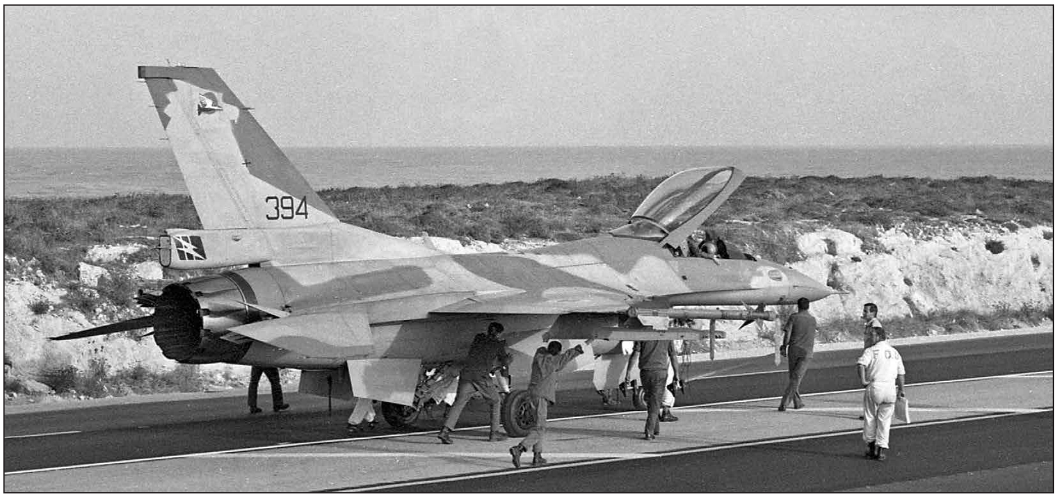
Israel went after the F-15C as soon as it became available. The air force would operate 18 Cs and 13 two-seat F-15Ds. The large number of Ds marked the type's growing importance in delivering heavy strike weapons in which a weapons operator was advantageous. This 106 Squadron F-15C lacks the common conformal fuel tanks and carries an electronics pod. (Ofer Zidon Collection



Seeking to take advantage of the features of the F-15E Strike Eagle, but with Israeli content, the IAF took up 25 F-15Is beginning in 1998. It offered along-range, heavy strike capability to permit missions to Iran if that ever became necessary. This 69 Squadron jet is fully armed-up for a pilot graduation ceremony display at Hatzerim AB, to include the twin LANTIRN pods. (Author's Collection)



The "low-cost" end of the new generation of American combat aircraft, the single-engine F-16A and B Falcon, was sold to Israel in large numbers and operated from 1980 until 2016. As with the F-15, these additions marked the IAF as among the most modern and best equipped air forces in the world. This F-16A, at the entrance to a hardened aircraft shelter, is seen in 235 Squadron markings and wearing kill roundels from the 1982 fighting, with flare/chaff dispenser grafted to the vertical tail island. (Author's Collection)



The F-16 acquisitions continued with the F-16C that possessed greater strike capabilities. A relatively large number of two-seat D models were included to accommodate the weapons systems operator and further the move to dual-seat combat aircraft that the Israelis adopted. This late-service F-16C of 110 Squadron is performing practice operations on a coastal highway on August 31, 1990. (Ra'anan Weiss Collection)

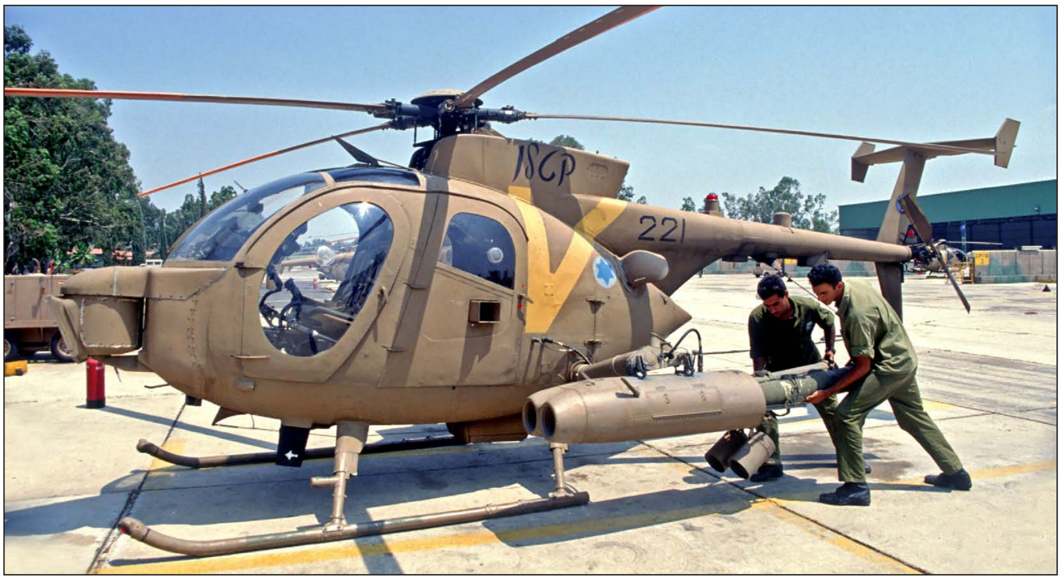
The F-16D experience suggested a greater potential for the single-engine strike jet if suitably equipped, and this begat the F-16I. The service acquired 102 of these fighter-bombers to equip four squadrons and fitted them with the most advanced weapons and electronics. This 201 Squadron jet is equipped with LANTIRN pods, American AIM-120 and Israel Python 5 missiles, and 2,000-lb Spice bombs. (Nir Ben-Yosef Collection)

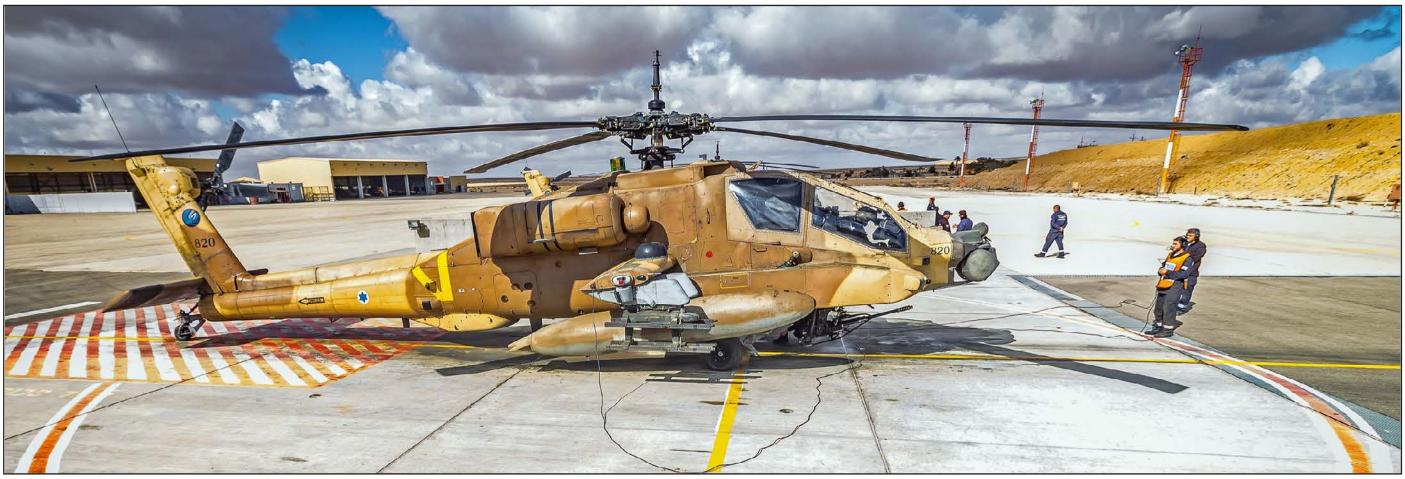
The new stealth technology appealed to the IAF as another means of evading detection and engagement by the latest Russian anti-aircraft systems being introduced into the region. After some unpleasantness over Israeli sales to China, Israel was permitted to participate in the Joint Strike Fighter program and acquire F-35As specially equipped for the IASF as F-35Is. An order for 50 was eventually consummated, with potential plans for this to grow. (Israeli Air Force)

ATTACK HELICOPTER

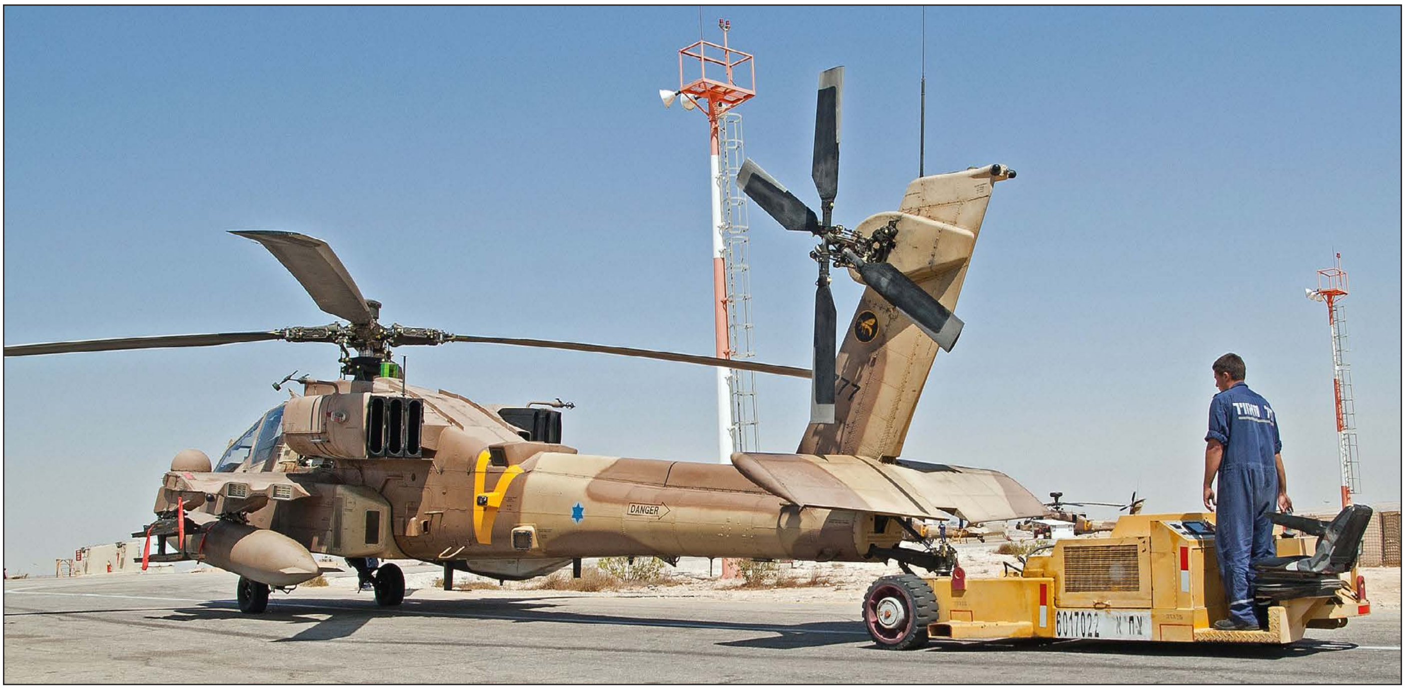
The new battlefield realities revealed by the Yom Kippur War experience led the IAF to pursue American attack helicopters for anti-tank warfare via the Bell AH-1 Cobra and TOW missile. It was a few years before operationally suitable systems was available, but the IAF then acquired 68 aircraft in five models employed by two squadrons for nearly 40 years. These 161 Squadron machines are photographed at one of the minimally equipped alert fields on the northern border. (Ofer Zidon Collection)

At a point when the Americans dragged their feet on Cobra deliveries, the IAF found a less expensive if less capable system in the Hughes 500MD. Carrying four TOW but no other armament, the little helicopter was spritely and easy to maintain. It was bought in fewer numbers and initially served beside the Cobras before 190 Squadron was formed where this aircraft was photograph in 1993 at Ramat David. (IAF Magazine via Ofer Zidon)





Seeking to keep abreast of weapons technology, the IAF long sought the very expensive AH-64 before achieving the goal in 1990. The Apache eventually displaced all the earlier attack helicopters and was very effective with the Hellfire missiles and superior electronics. This 190 Squadron AH-64A is seen at Ramon AB preparing for flight. (Israeli Air Force)

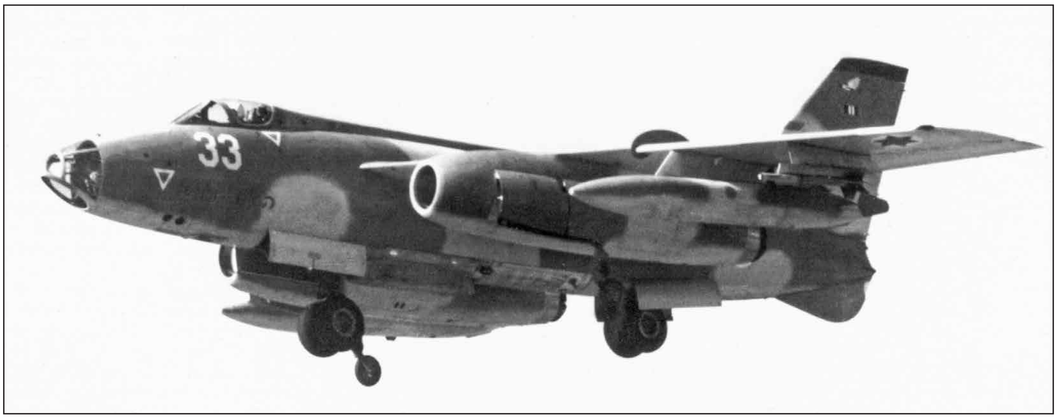


The growth of the Apache in the AH-64D Longbow configuration offered many important capabilities the Israelis desired. Again, it was years before the money could be found, negotiations on equipment content concluded, and then manufacture and delivery. Only 17 of the helicopters were acquired and operated by 113 Squadron at Ramon AB, where this machine was photographed. (Ra'anan Weiss Collection)

BOMBER

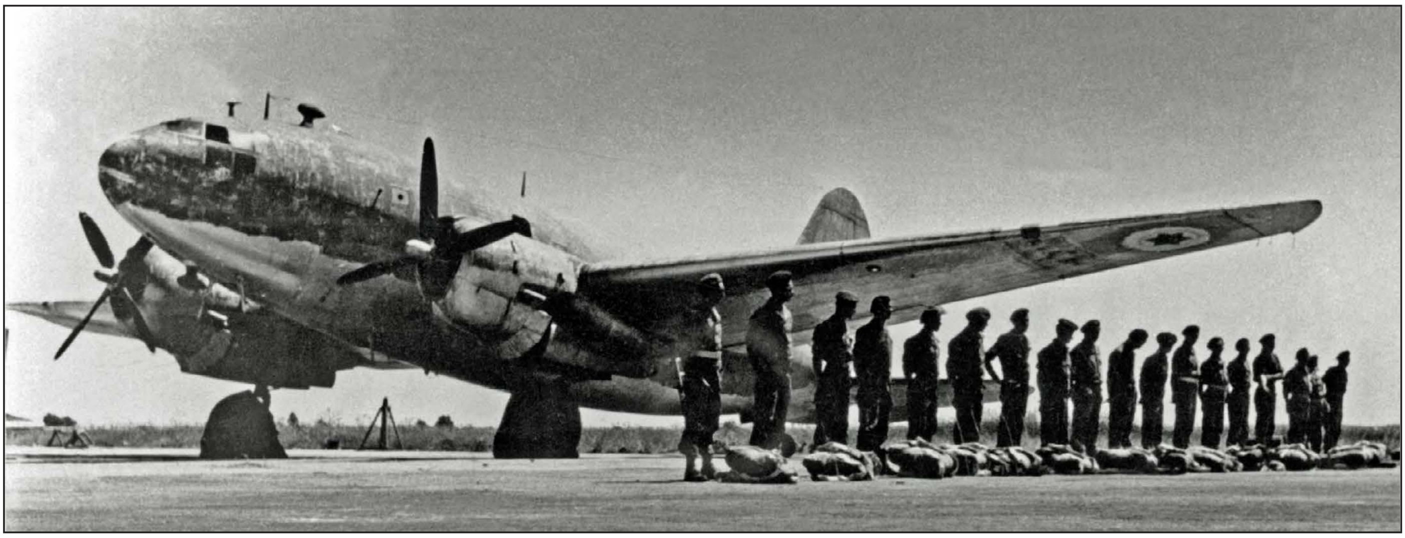
Three Hudson bombers, converted to civilian transports, were acquired in Australia and flown to Israel late in the War of Independence. After adding some jury-rigged bombing accoutrements, these aircraft contributed a few missions. The Lockheeds were pensioned off within a few years following the war to reduce the number of disparate and maintenance intensive airplanes. (BIAF – Israel Aerospace Magazine)

Three B-17s were delivered via the usual surreptitious means in July 1948, bombing Egypt on the delivery flight. They performed remarkably during the war and for maritime patrol in peacetime. Two were put up during the 1956 war with great effort, but their contribution was small and they were discharged soon after. (Shlomo Aloni Collection)

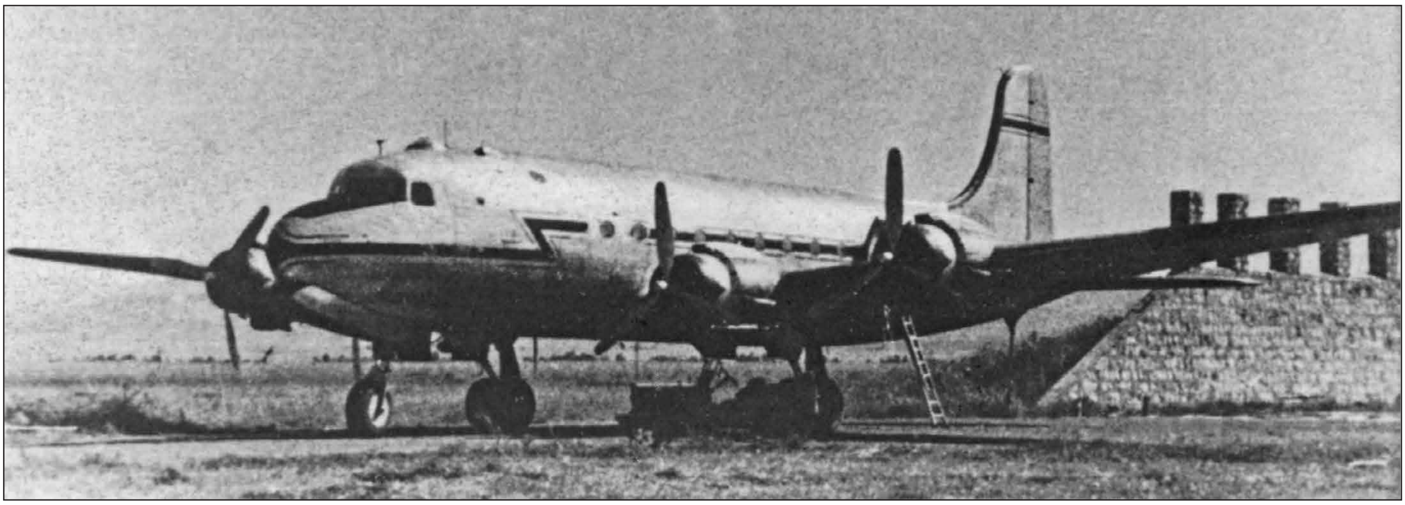


The French were able to provide a long-range jet bomber in the Vautour II, to hold at risk distant airfields supporting the IAF’s preemptive strike plans. The service took 19 single-seat Vautour IIAs, four two-seat glass-nose IIBRs used principally for photo reconnaissance, and eight two-seat IIN night fighters with nose radome. All three models performed strike missions until turned to EW and test roles late in their service lives. This 110 Squadron Vautour IIB, 33 “Big Brother,” reveals its two camera ports under the nose and a unique fairing just aft of the nose gear doors, plus the Shafrir missile installation outboard of the 1,250-l drop tanks. (BIAF – Israel Aerospace Magazine)

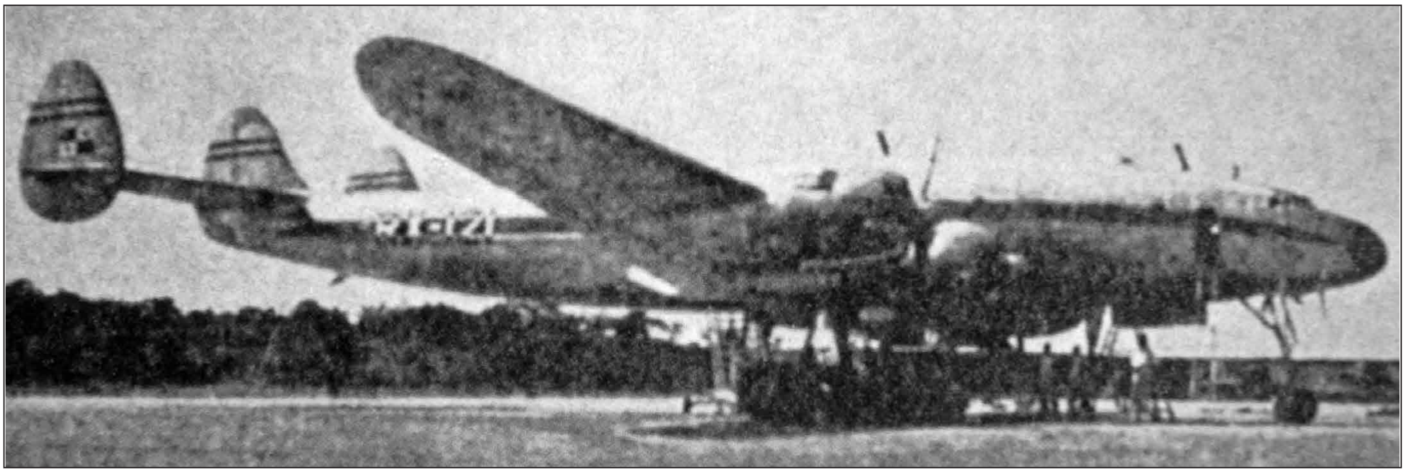
HEAVY TRANSPORT



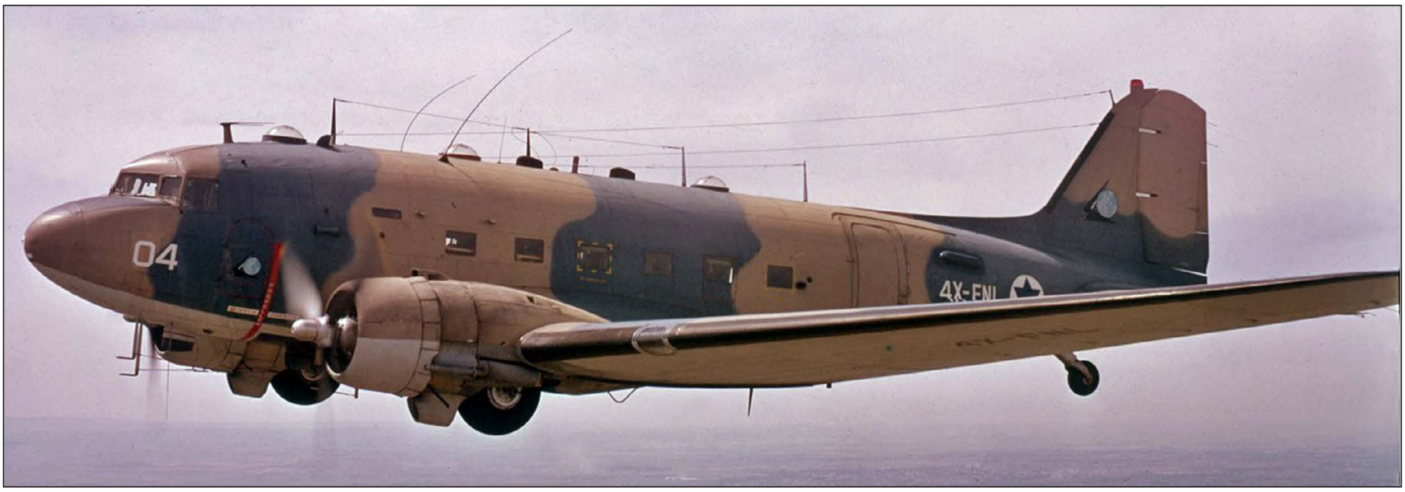
A handful of Curtiss Commandos played a vital role during the War of Independence carrying arms from Czechoslovakia to Israel under difficult circumstances. They also served as ersatz "cargo bombers" with explosives rolled out the aft troop door. The C-46 served on in the IAF until 1952, to include acting as a paratroop platform and bringing refugees into the country, with most then going to local airlines. (BIAF – Israel Aerospace Magazine)



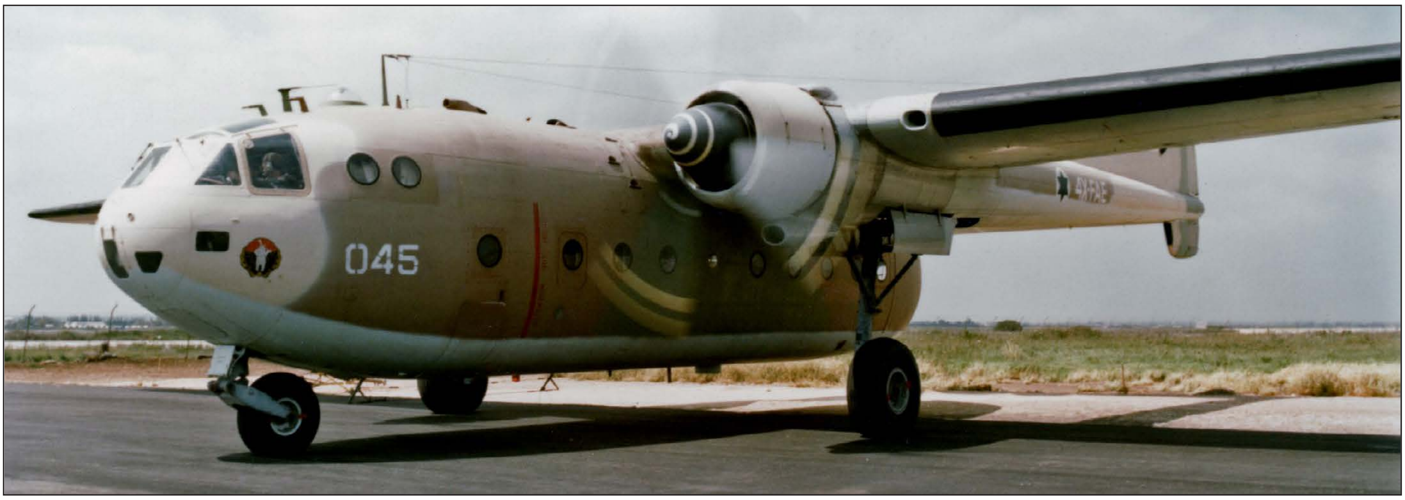
Israel acquired two Douglas C-54s that supported the airlift of munitions from Czechoslovakia during 1948, able to make the flight nonstop. Following that operation, the aircraft continued to operate mostly to and from Europe, with one lost assisting in the ferry of Spitfires to Israel. The other transitioned to airline service soon after the war. (Author's Collection)



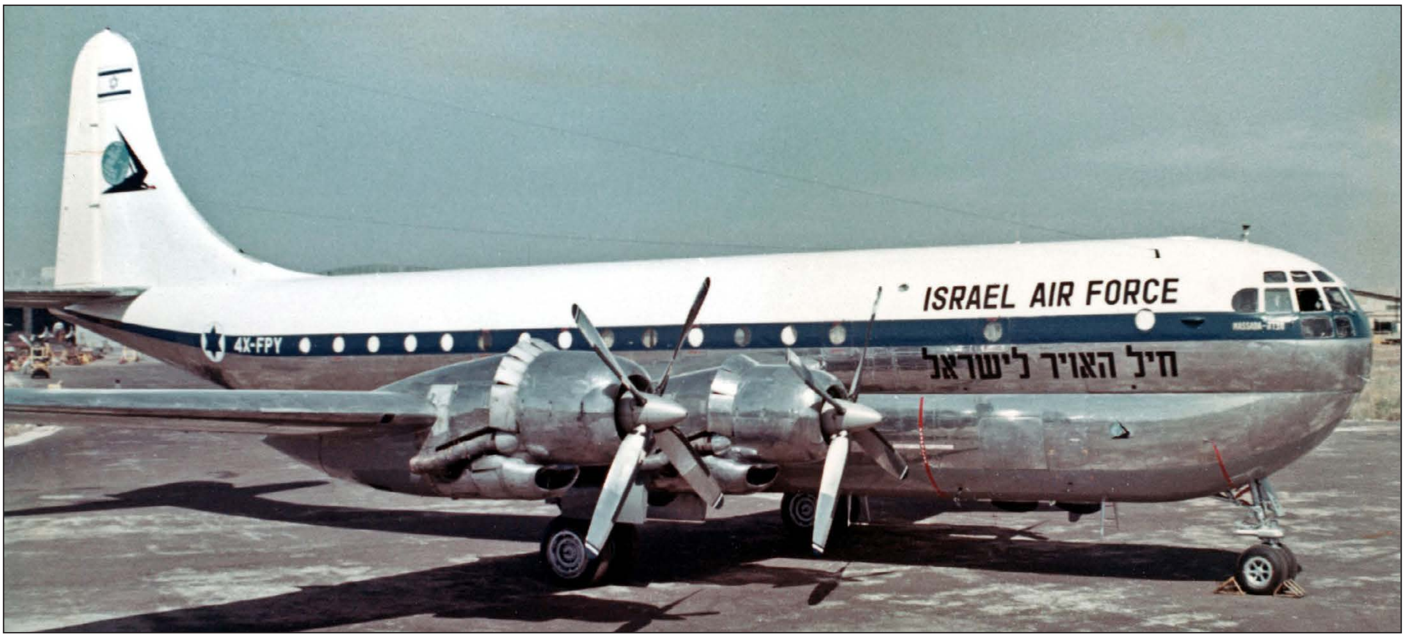
The single Lockheed Constellation operated by the IAF was among three purchased and overhauled in America with the intent of illegal transport to Israeli. Only one of the C-69s made it as part of a bogus airline (Panamanian markings shown) and executed a couple of valuable weapons delivery runs from Czechoslovakia before being seriously damaged. Repair was protracted and the airplane passed to the national airline before returning to Israel. (Author's Collection)



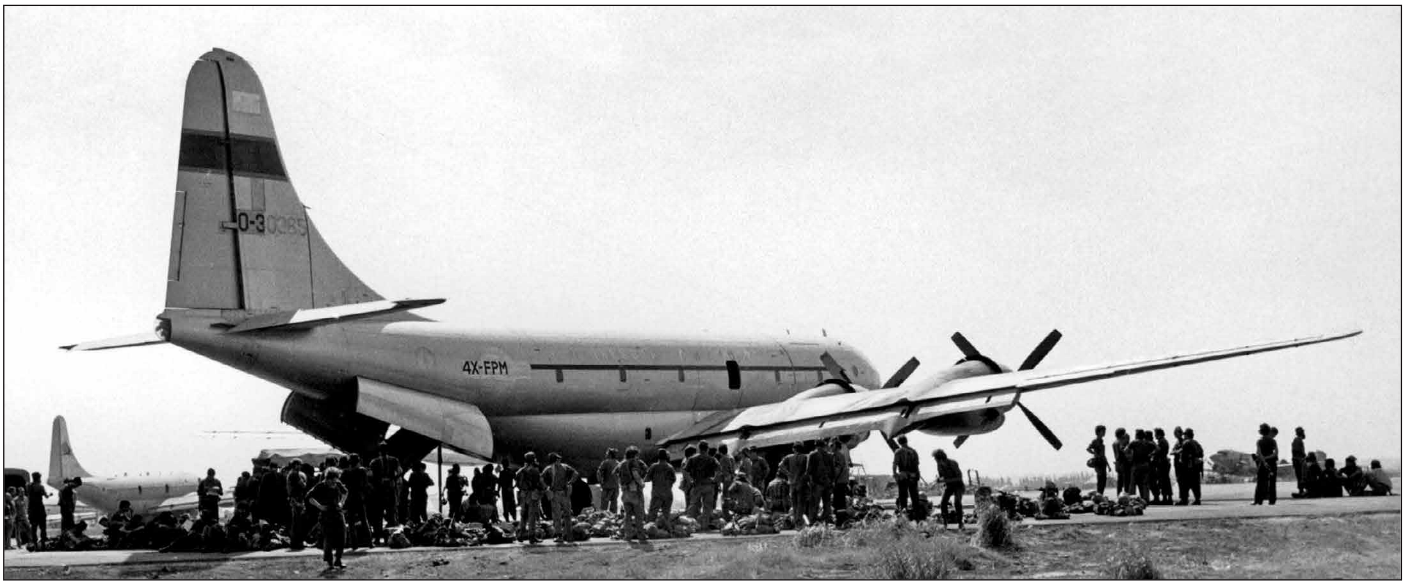
The IAF operated C-47s from its inception until 2001. During the 1970s, it was humorous to see the Israelis flying Dakotas – and advertised as a heavy transport – but by the turn of the century it was more than odd to see a world-class air force retaining such aircraft beside F-15s and Apaches. However, the Second World War transport was inexpensive to operate and modified for special missions – this 120 Squadron aircraft was employed as a navigator trainer. (IAF Magazine via Ra'anan Weiss)



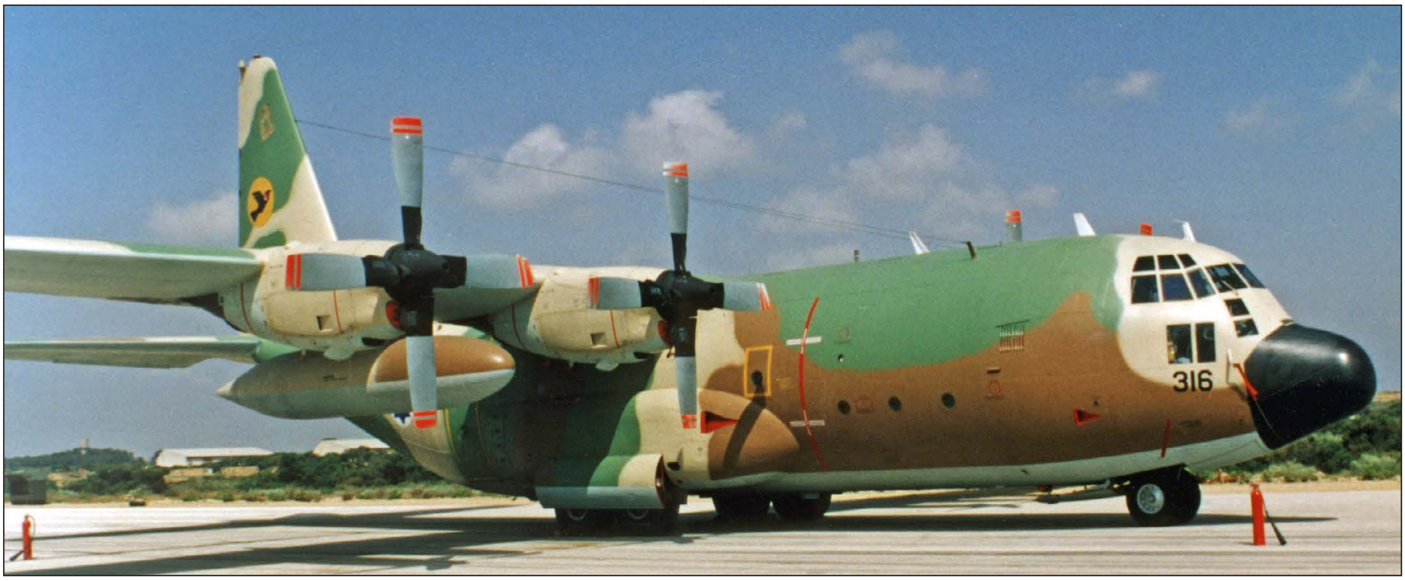
The IAF was able to acquire more modern transports from the French in the form of the Nord Noratlas. These were more suitable for airdrop and to perform flights to the continent to bring back war materiel. These two dozen airplanes were also operated well past their prime because of the cost of replacement – a repeating theme for the IAF. This shows a 103 Squadron machine photographed in 1978 at Lod AB. (BIAF – Israel Aerospace Magazine)



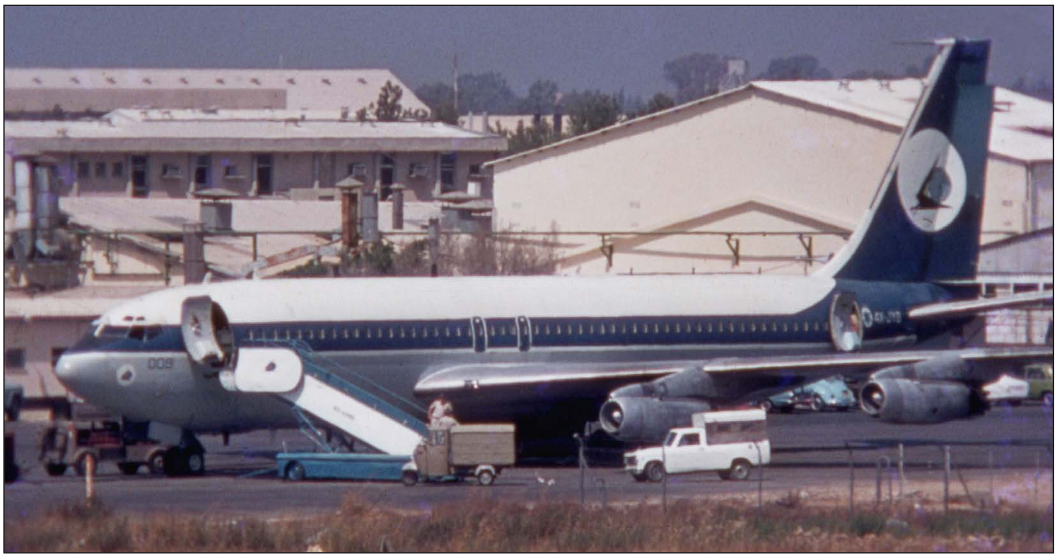
Seeking even heavier lift transports, the IAF was compelled by budget to buy retired four-engine Boeing B377 airliners militarized with elements of C-97s, and then mothballed KC-97s. This example was "dolled-up" as an executive transport to carry the Prime Minister on state visits to African nations in 1966 during a period in which Israel had a thriving exchange with these countries. (BIAF – Israel Aerospace Magazine)



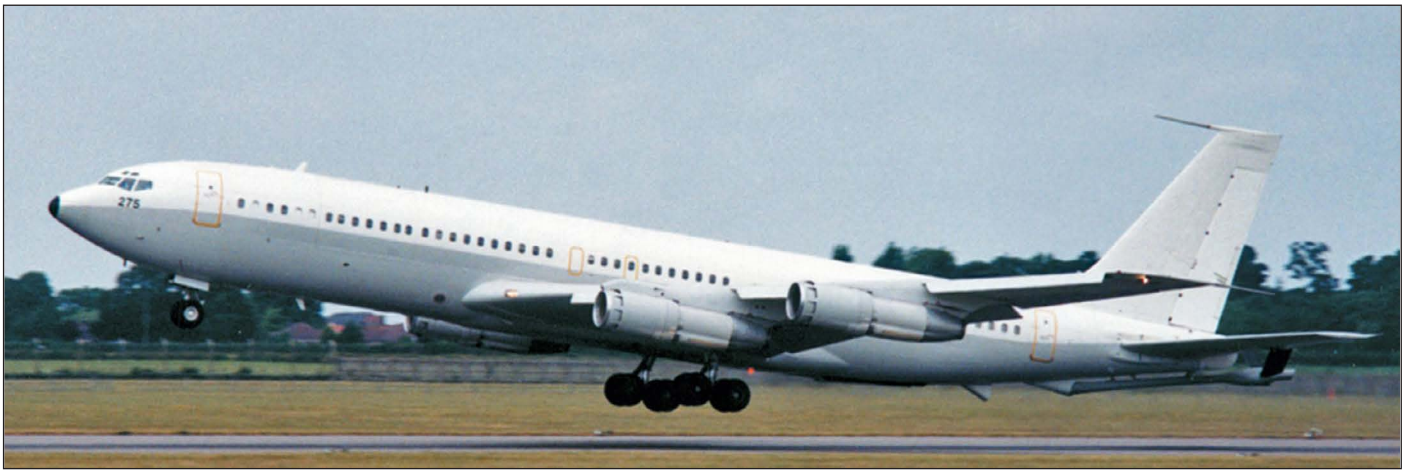
Israel bought KC-97s as late as 1973 to serve as transports and aerial refueling tankers. The type was hopelessly antiquated, had atrocious serviceability, and was costly to maintain, but the alternative C-130 was just too expensive to buy in the desired numbers. This example is seen during the Yom Kippur War when it was pressed into service while being overhauled and modified by Israel Aircraft Industries – note the incomplete markings and finish. (BIAF – Israel Aerospace Magazine)



The IAF finally got their desired transport, the Lockheed C-130, in 1970 but in small numbers given the high cost. Only during and after the Yom Kippur War was the fleet able to grow, with tankers and EW examples added – this machine an E-model operated by 131 Squadron. The Hercules continued in service with new C-130Js acquired beginning in 2014, displacing many of the earlier aging models. (Author's Collection)

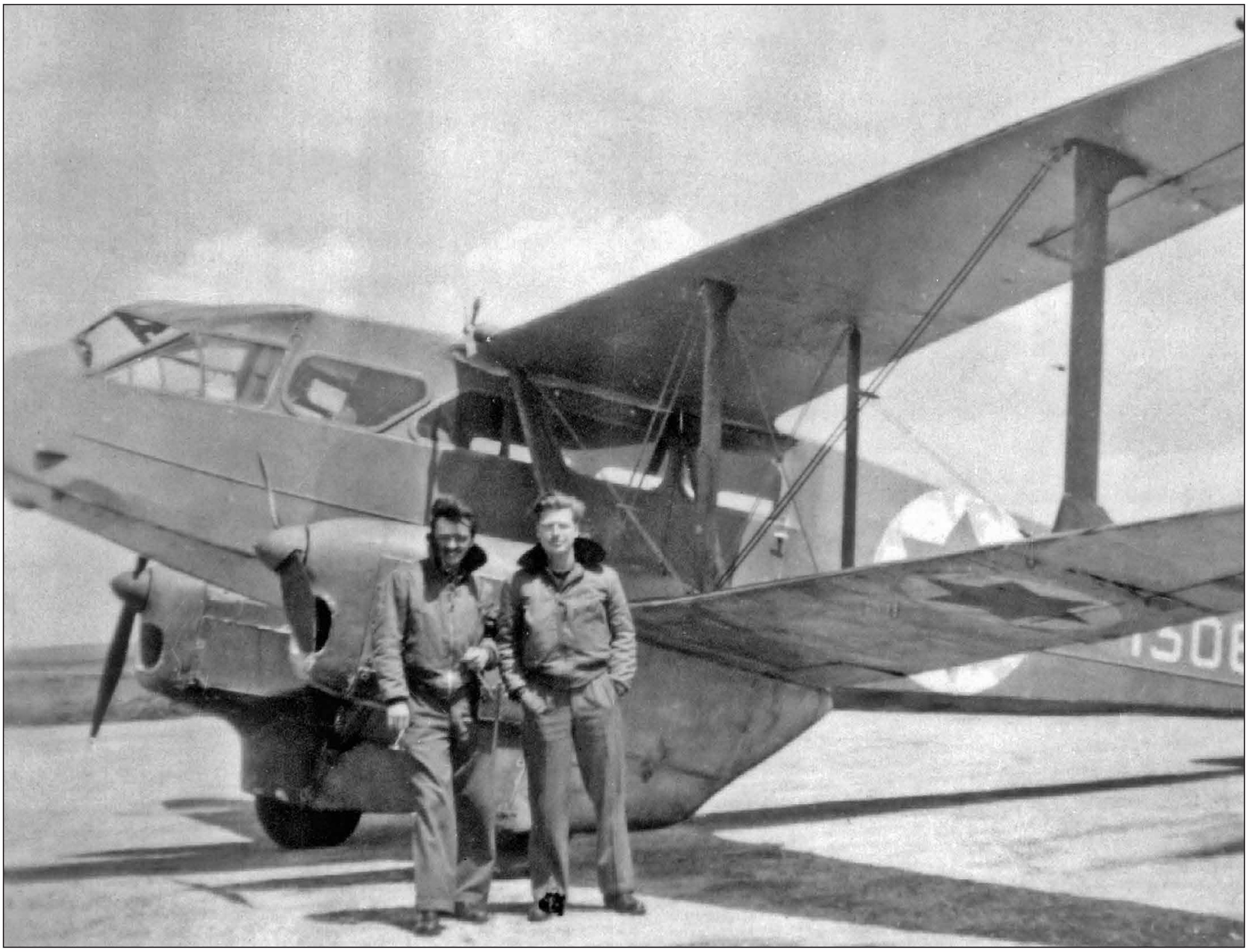


Transoceanic flight to the US for heavy transport led to acquisition of the Boeing 707 which was familiar via operations by the national airlines and Israel Aircraft Industries overhaul plus modification work. A large number of these aircraft passed through IAF hands since 1973 and were employed in many missions – this 120 Squadron example at Lod AB. These were growing quite long in tooth by 2021, but replacement remained an endeavor of discouraging expense. (Ed Okun Collection)

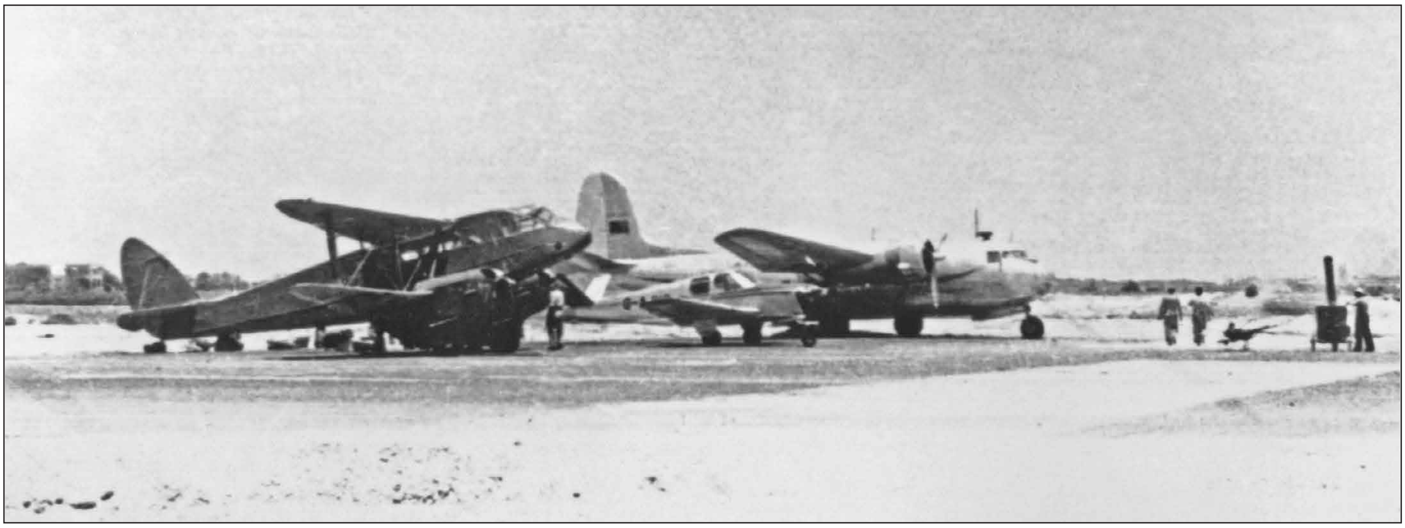


The growing number of American combat aircraft fitted for boom refueling, and the distant threats to hold at risk, compelled the IAF to build a tanker force. This was a slow and arduous task given American recalcitrance, and the engineering and modification requirements. Yet, the Israeli “KC-707” capability was introduced in the mid-1980s and sustained in respectable number to date of writing – although the air force desired a more modern and cost-effective platform. (Amos Dor Collection)

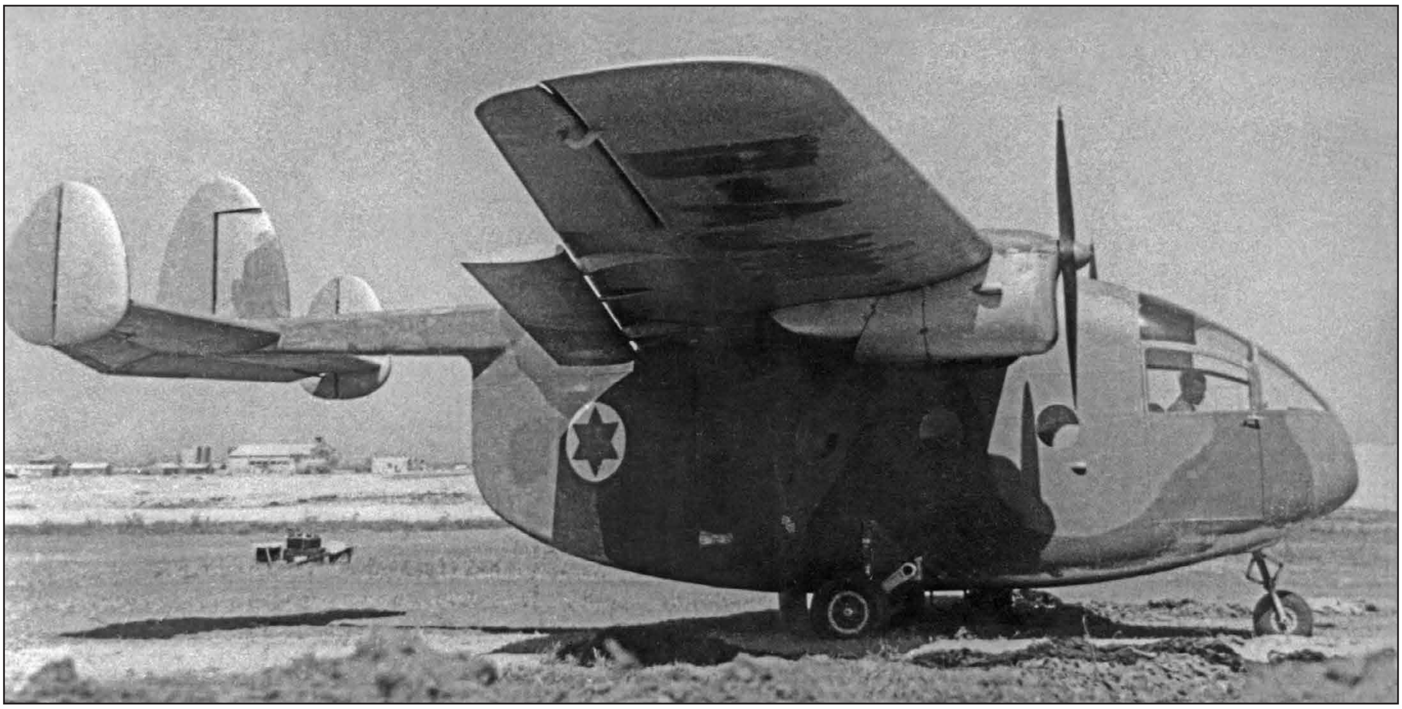
MEDIUM TRANSPORT



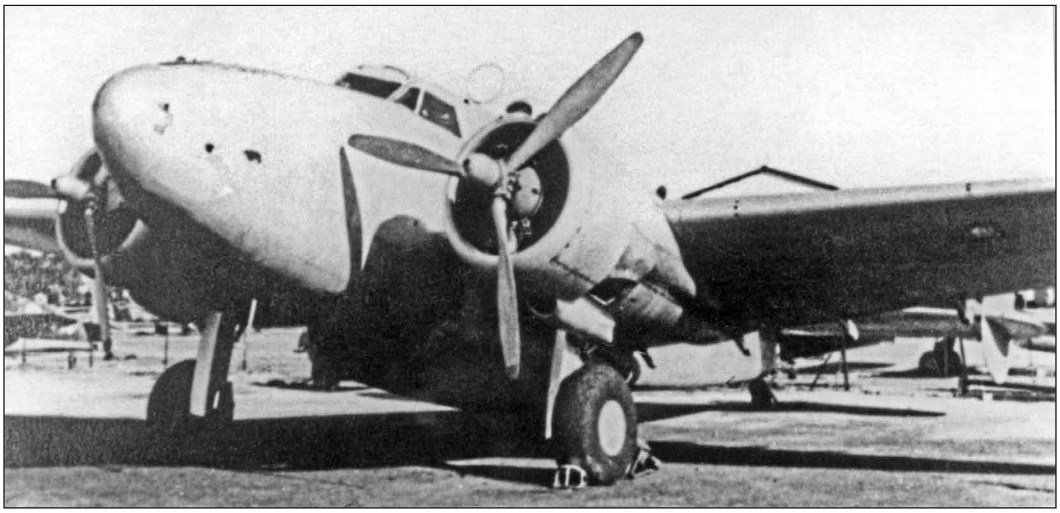
The de Havilland Dragon Rapide was a pre-war civil transport that performed roles during the Israeli War of Independence far beyond anything the designers likely envisioned. Astonishingly, the IAF continued to operate a small number of the biplane taildraggers until 1956 as testament to its low cost and utility. This aircraft, 1308, was a Jordanian airliner seized in 1950. (Author’s Collection)



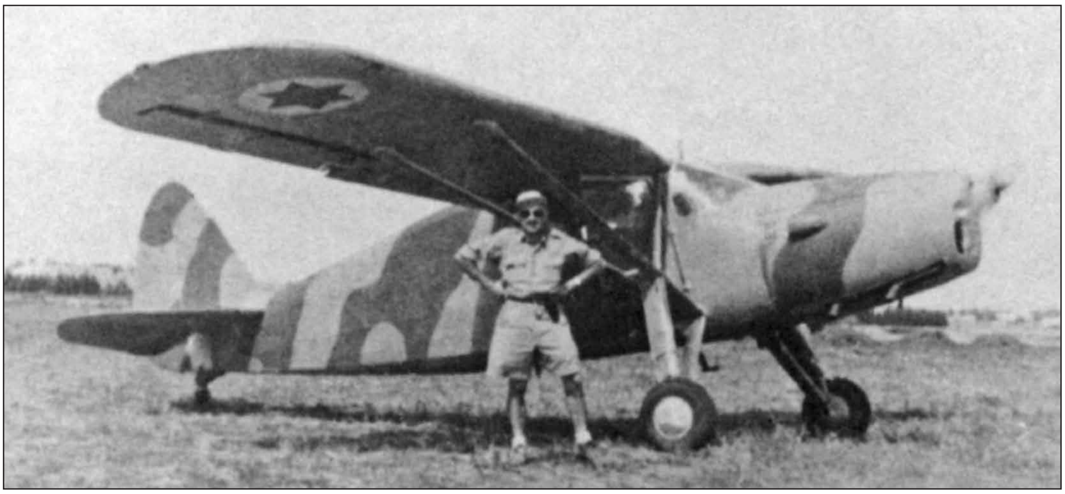
The one-off Douglas DC-5 is seen in the company of a Beech Bonanza just arrived from the Netherlands and an unidentified Dragon Rapide. The DC-5 reached Israel via a circuitous existence and performed reasonably as a transport and "bomber," but only briefly before it was damaged and set aside. The photograph was like taken at Sde Dov during summer 1948. (David Farer Collection, National Air and Space Museum. Smithsonian Institution)



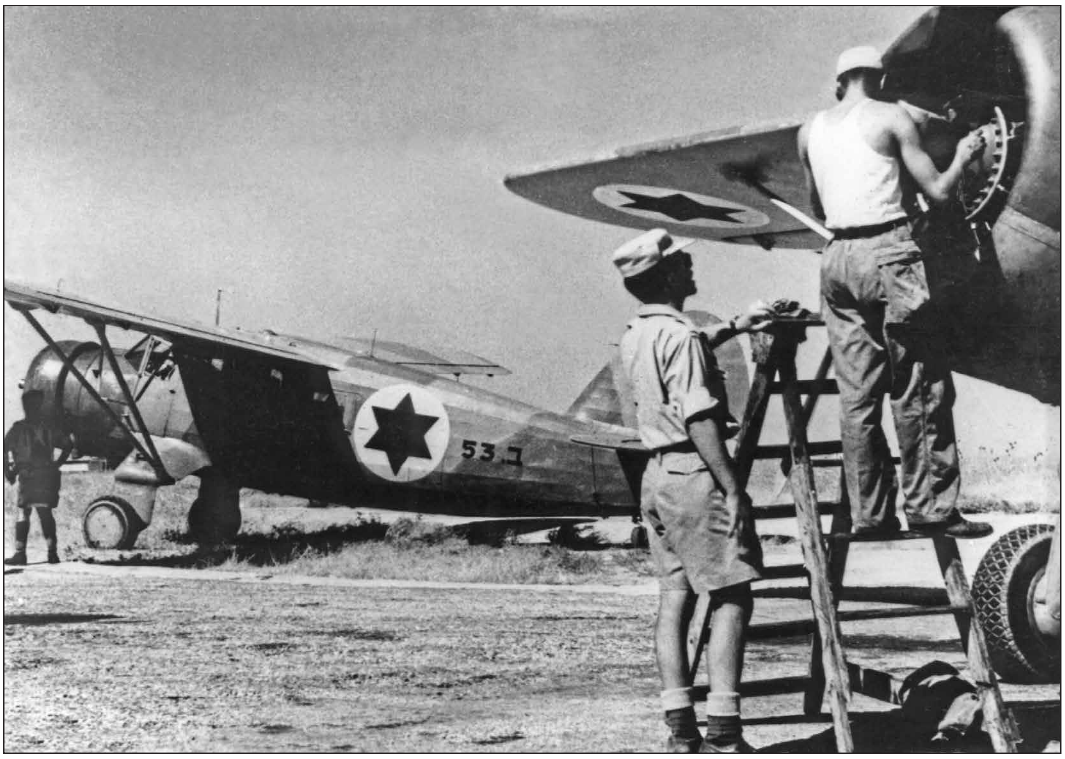
The sole Miles Aerovan had relatively rugged undercarriage and, matched with low-pressure tires, could operate from marginally prepared fields. The flaps permitted good short field performance as well, but the airplane was otherwise poorly suited to the demands placed upon it. It was lost on July 18, 1948, in a forced landing after which Arab irregulars murdered all aboard and set the wooden airplane ablaze. (BIAF – Israel Aerospace Magazine)



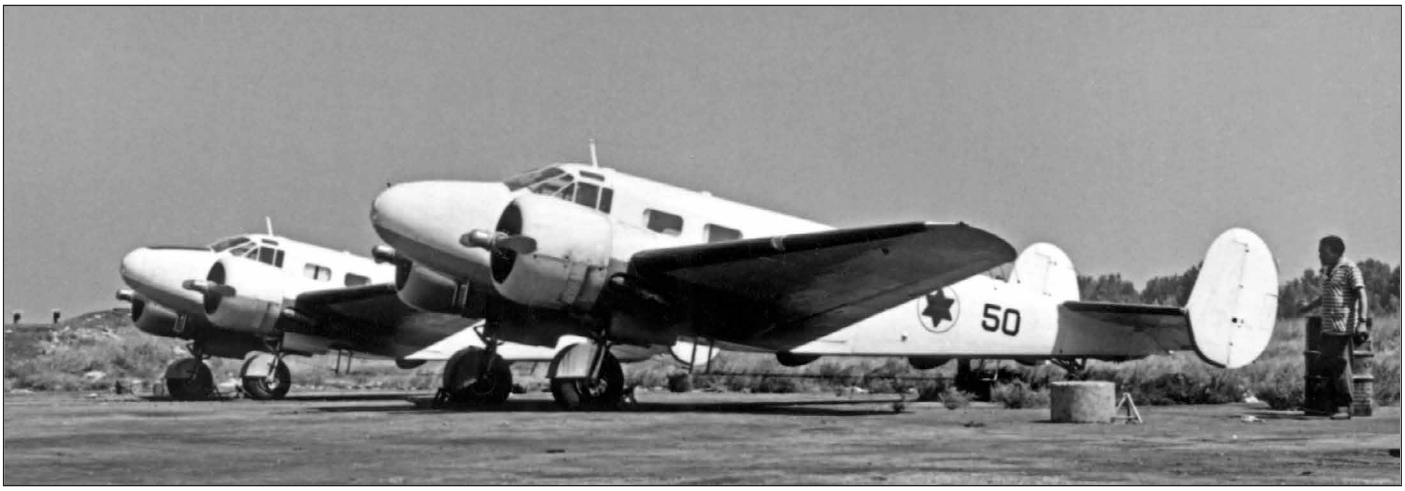
A single Lockheed Lodestar, a military C-60A, was acquired in Australia and flown to Israel late in the War of Independence. It arrived in time for the large-scale Negev airlift, but was damaged in a landing mishap soon after and may have been struck off charge. Another Lodestar may have taken up this aircraft's identity or the first lingered on the books into 1950. There is mention of a second Lodestar from Australia though this has yet to be formally confirmed or denied. (Author's Collection)



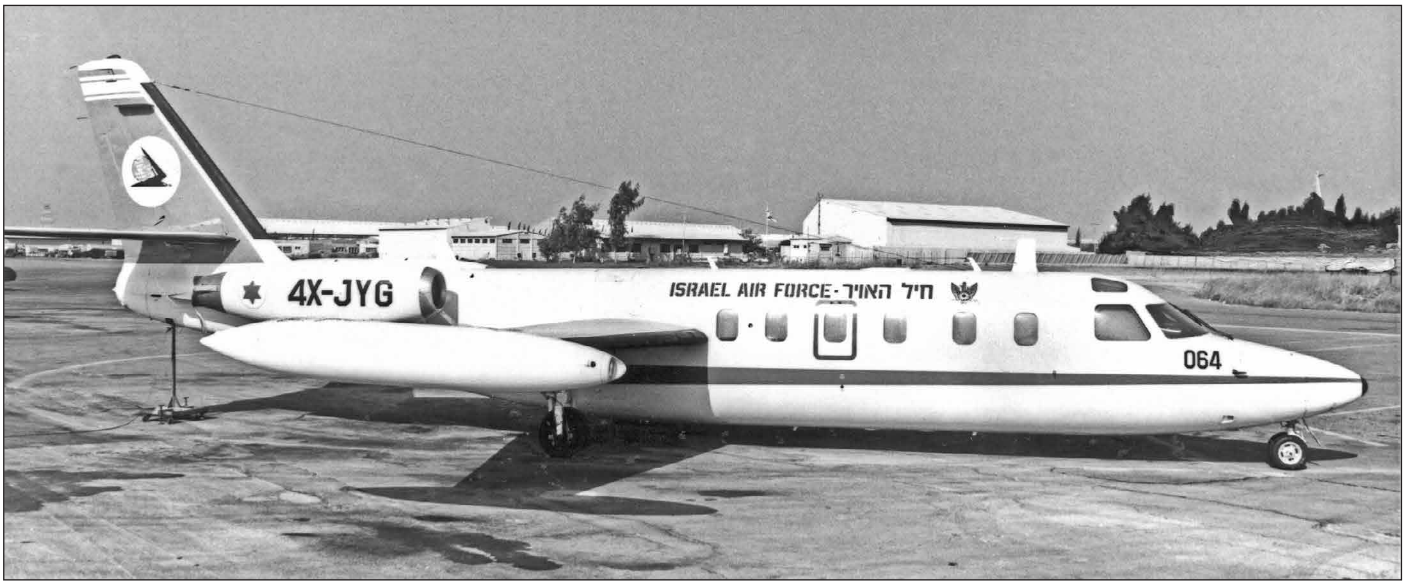
The service employed a handful of Fairchild Argus airplanes during the 1948 war. These were good performers and were even pressed into bombing duties. The type lingered into 1950 when the cash-strapped Air Force had to let go many of its odd types, like the Argus. (BIAF – Israel Aerospace Magazine)



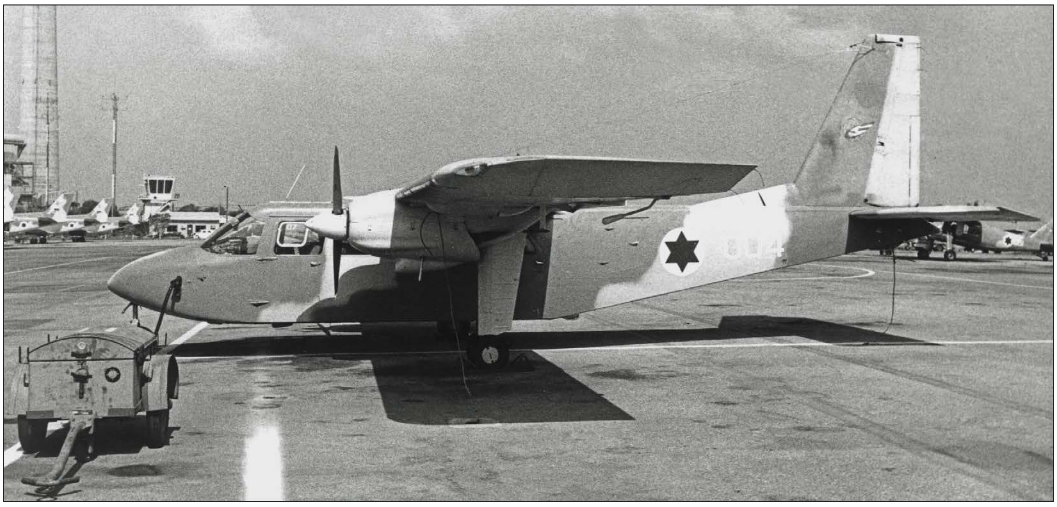
The Noorduyn C-64 Norseman was a rugged, high-capacity transport that was put to good use by the young Israeli Air Force. It could operate from improvised and short strips but suffered in the summer heat. Several were lost in combat and accidents, but a few were operated until 1954. (BIAF – Israel Aerospace Magazine)



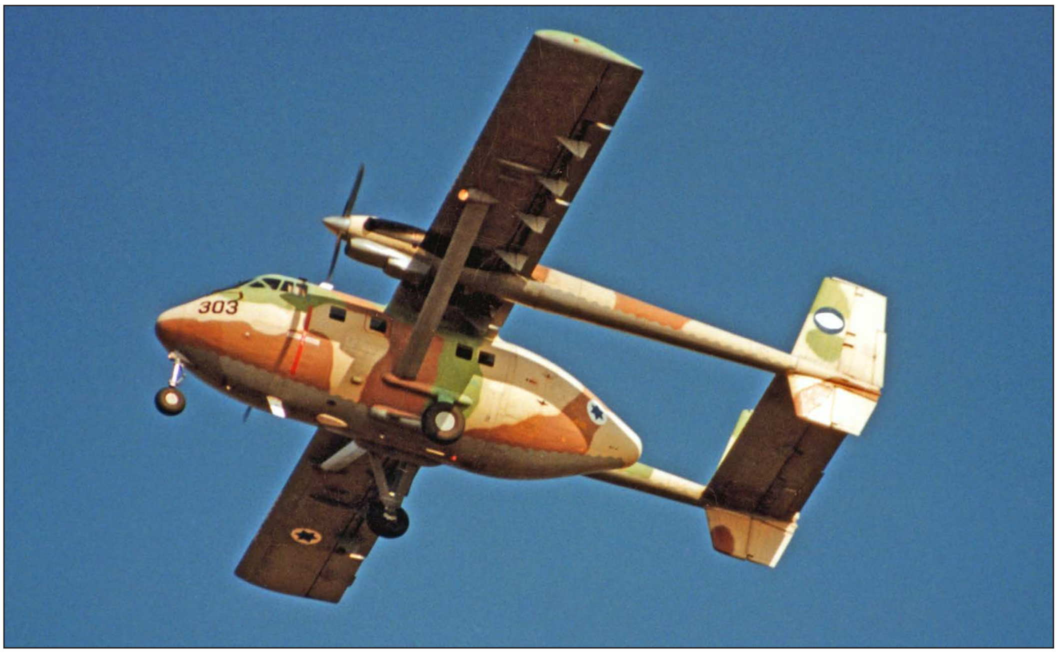
The local inland airline, Arkia, had acquired a pair of Beech C-45s whose service proved uneconomical. The aircraft were passed to the IAF in 1960 at a time when the service was trying to dispense with such aged equipment. They lasted for two years before sold abroad. (BIAF – Israel Aerospace Magazine)



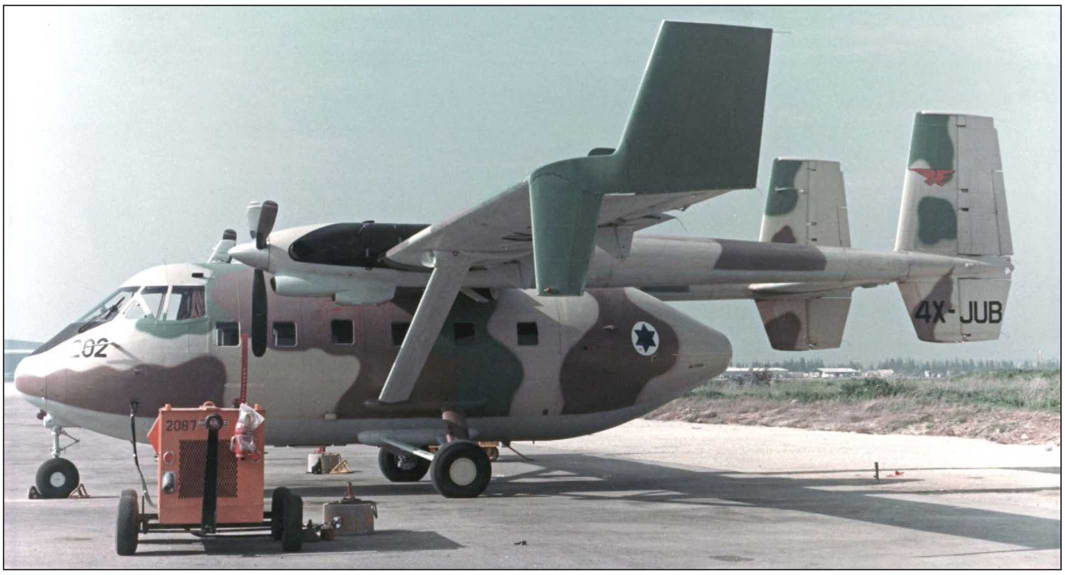
The Yom Kippur War emergency pushed the IAF's resources to their limits, and two Israel Aircraft Industries 1123 Westwind business jets were pressed into service. These were retained after the war as executive transports while more were acquired for eventual conversion to maritime patrol aircraft. Seven jets were operated in this manner through 1980, including this 1123 with VIP markings. (BIAF – Israel Aerospace Magazine)



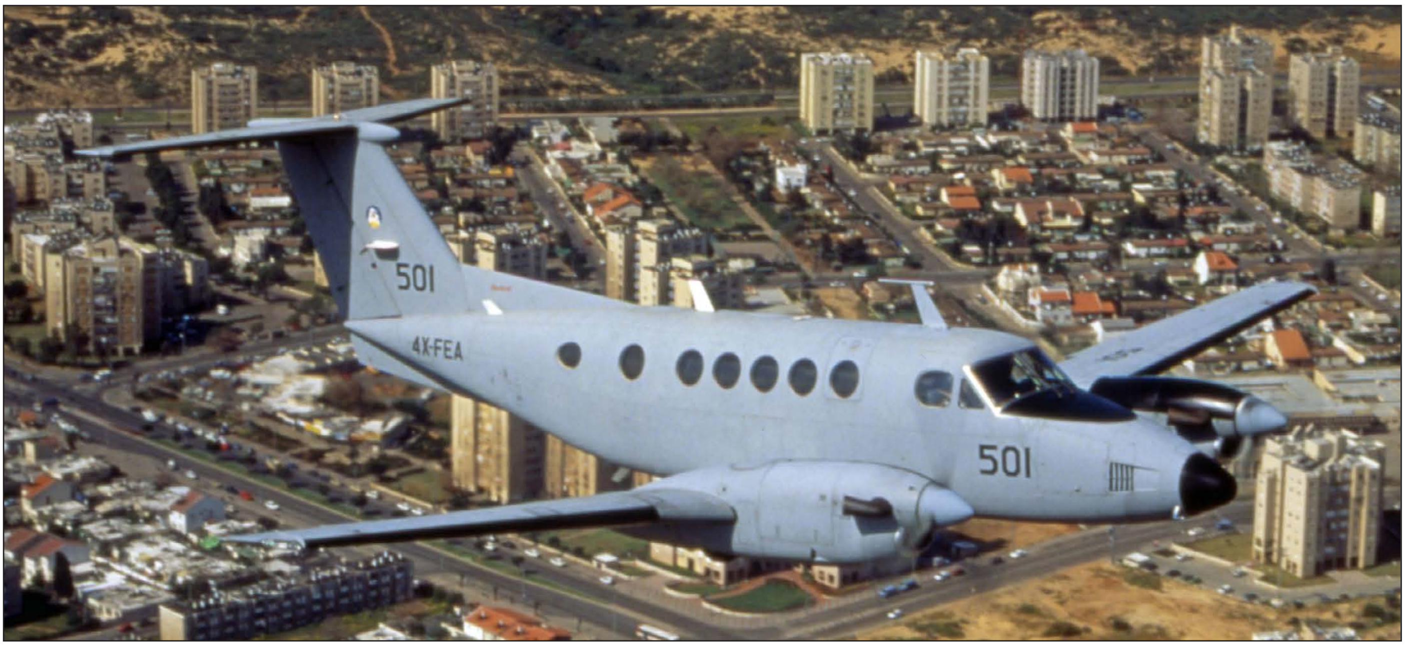
Eleven Britten-Norman Islanders also came to the IAF via mobilization during the October 1973 war from a local operator, and two were retained. These were rugged and high utility airplanes with wide cargo doors close to the ground. They also served as twin-engine and navigator trainers until discharged in 1980. (BIAF – Israel Aerospace Magazine)



The IAF operated three mobilized Israel Aircraft Industries Arava transports during the Yom Kippur War and another three during the June 1982 war in Lebanon. Two of the 1982 machines were subsequently purchased and more acquired as a combination of 101, 201 and 202 models – aircraft 303 being a 201 leased through late 1983 and seen in 122 Squadron markings. These served as general transport and paratroop jump training platforms. (Aero Mapho)

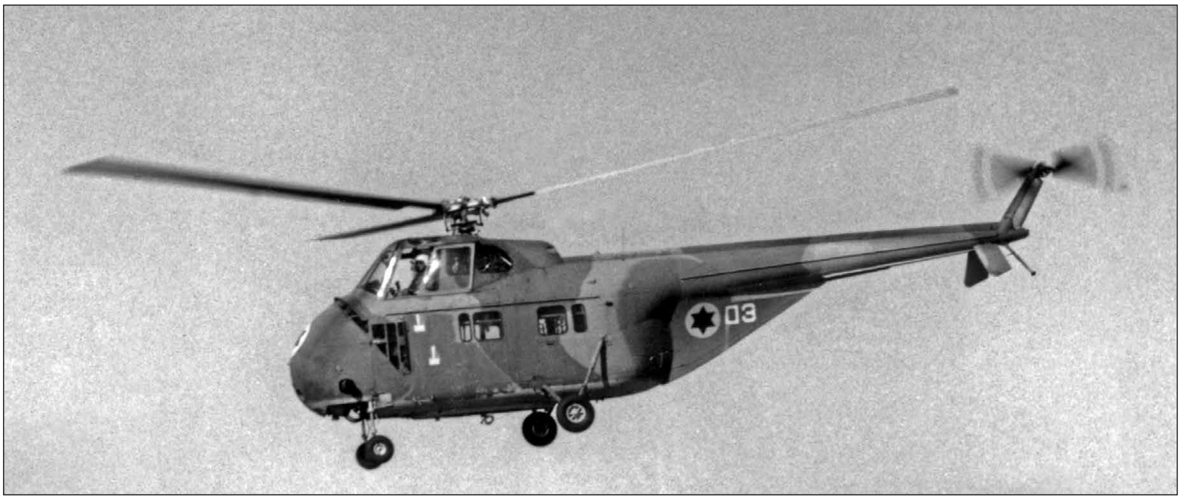


The Arava 202 from the Lebanon experience was retained and seven more acquired for conversion to electronic warfare duties. These would come to have a bulbous nose radome and the fuselage aft cone replaced with a radome-like fairing, plus many added antennae. Aircraft 4X-JUB 202 of 122 Squadron was the airplane from Lebanon seen prior to its EW modifications. (Author's Collection)

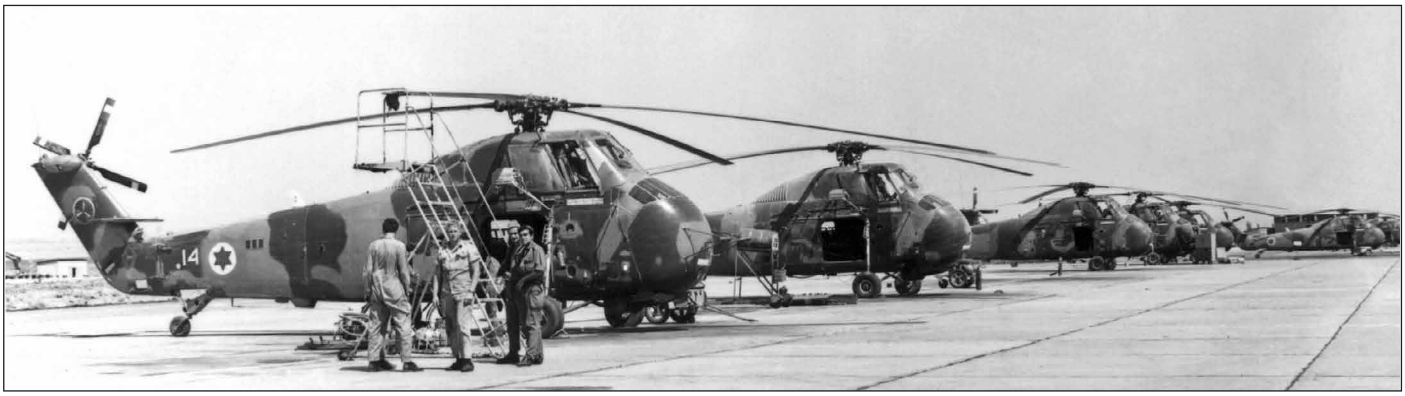


Upgrading its equipment saw acquisition of the turboprop Beechcraft B200 King Air beginning with four in 1990. More were picked up in the early 2000s and again later for nearly two dozen to support training and surveillance in addition to transport duties. This 100 Squadron example is typical of the finish and markings. (IDF Spokesperson)

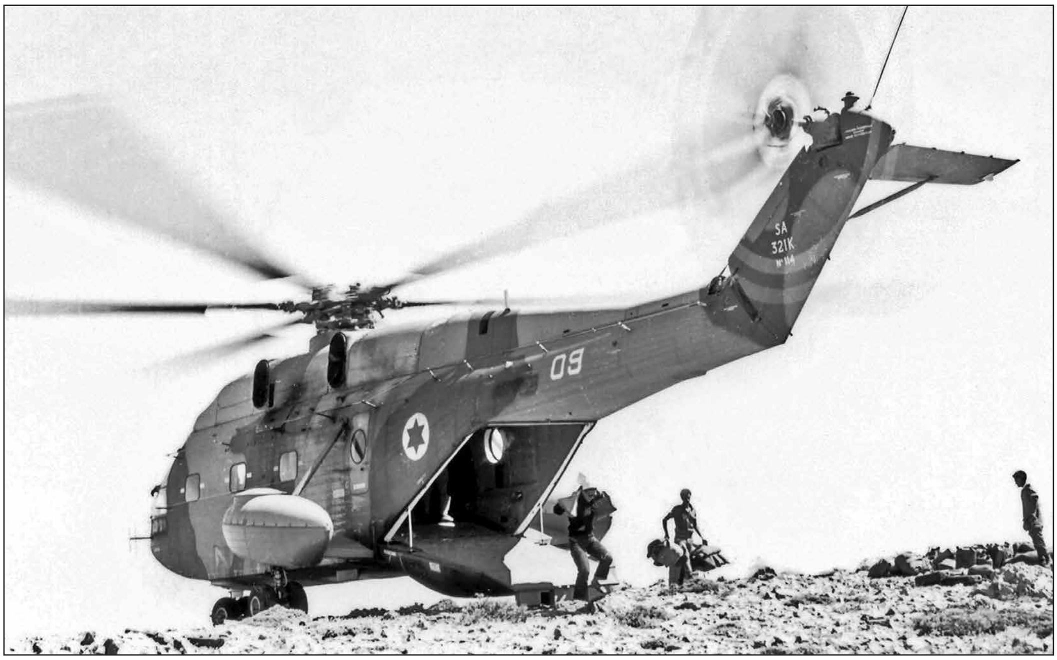
ASSAULT HELICOPTER



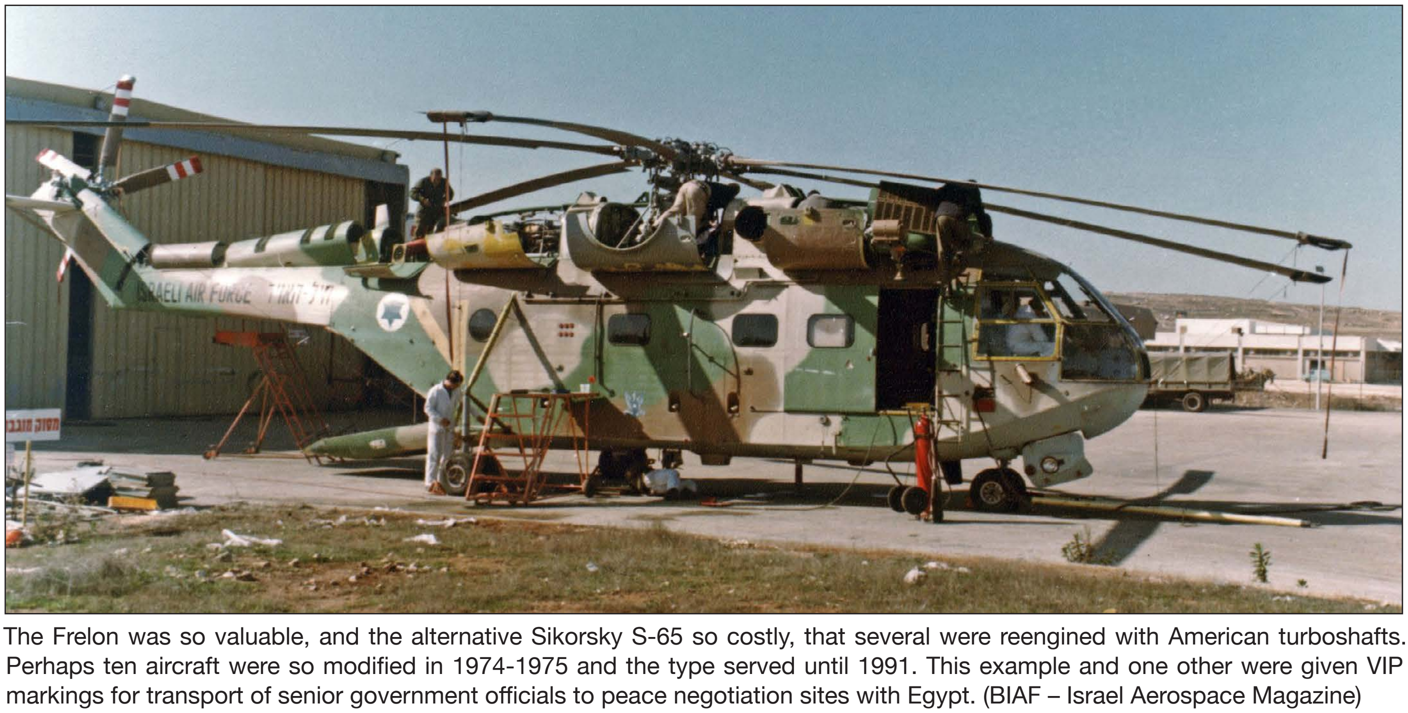
Seeking to grow a heliborne warfare capability, the IAF acquired two Sikorsky S-55s in 1956. These did not do so well in the Middle East climate but were put to good use through 1963. Search and rescue plus commando insertion/extraction were the glamour missions. (BIAF – Israel Aerospace Magazine)



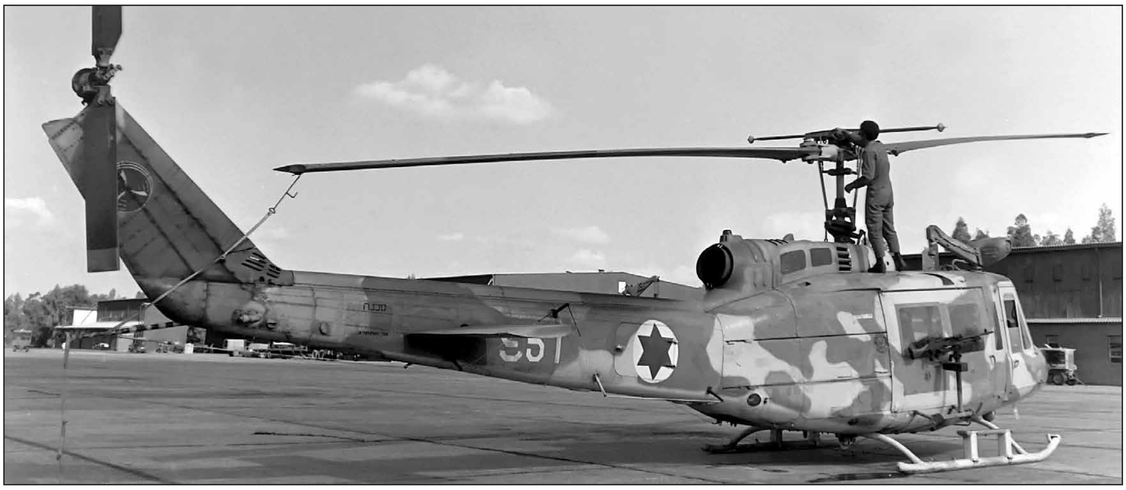
Expanding the embryonic vertical maneuver elements had to wait until the mid-1960s when funds became available for the Sikorsky S-58. Many of these came by way of secret reparations from Germany. Their role with 124 Squadron in paratroop and casevac operations during the Six-Day War and at other times were renowned. (BIAF – Israel Aerospace Magazine)



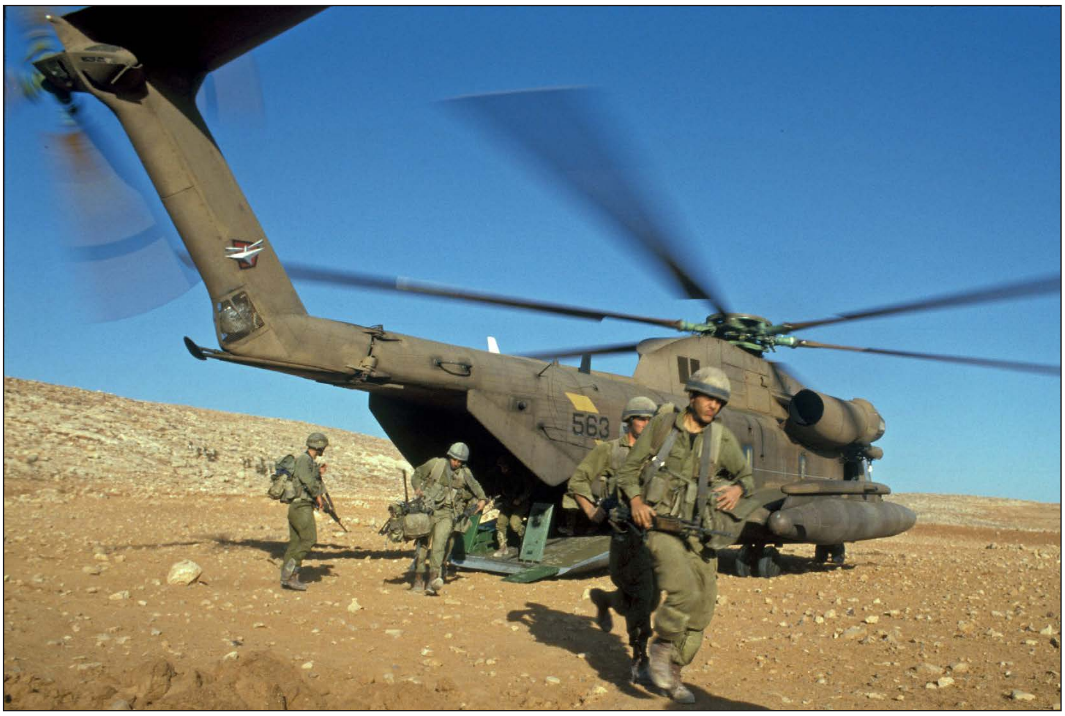
The Super Frelon was one of the important contributions by France to Israeli military airlift assets. Jet powered and with a capacious interior accessed by a loading ramp, it proved a vital resource during the 1967 war and after. This 114 Squadron machine, shown during the Yom Kippur War, retains the pontoon floats. (Ofer Zidon Collection)



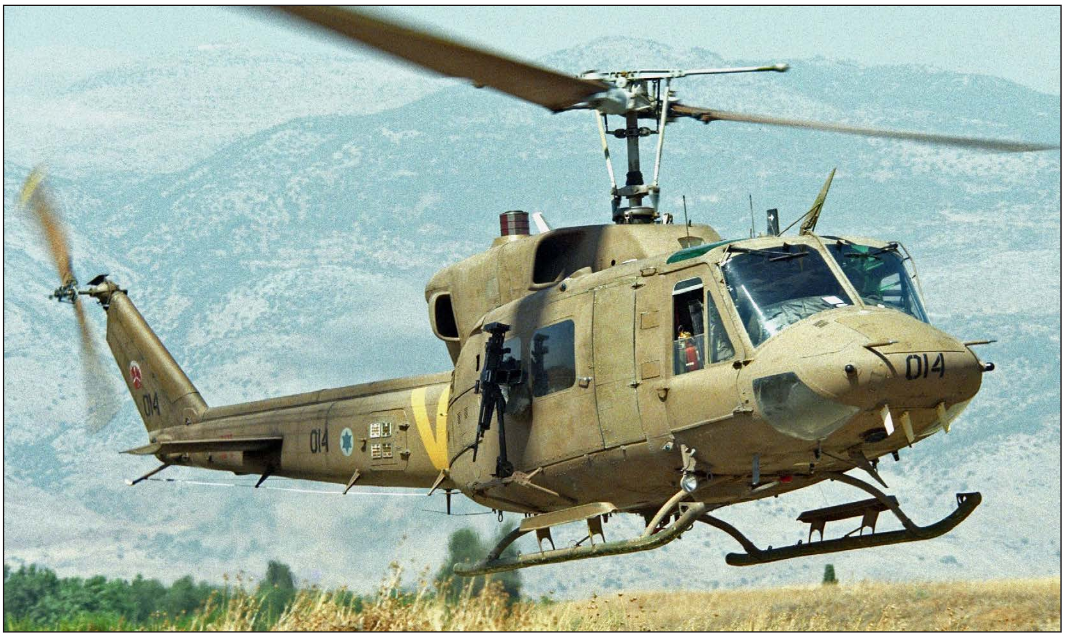
The Frelon was so valuable, and the alternative Sikorsky S-65 so costly, that several were reengined with American turboshafts. Perhaps ten aircraft were so modified in 1974-1975 and the type served until 1991. This example and one other were given VIP markings for transport of senior government officials to peace negotiation sites with Egypt. (BIAF – Israel Aerospace Magazine)



The closer relationship with the Americans after the Six-Day War permitted the IAF to replace the S-58s with turbine Bell 205s. Given the success of heliborne operations during the war, the force of such medium assault helicopters was doubled, with 51 machines acquired in the US and Italy, but serving only 10 years given modest performance in the summer heat with their single engine. This 124 Squadron 205 is seen at Tel Nof AB during the Yom Kippur War with a FN door gun and skid step. (Asher Roth via Ra'anan Weiss)



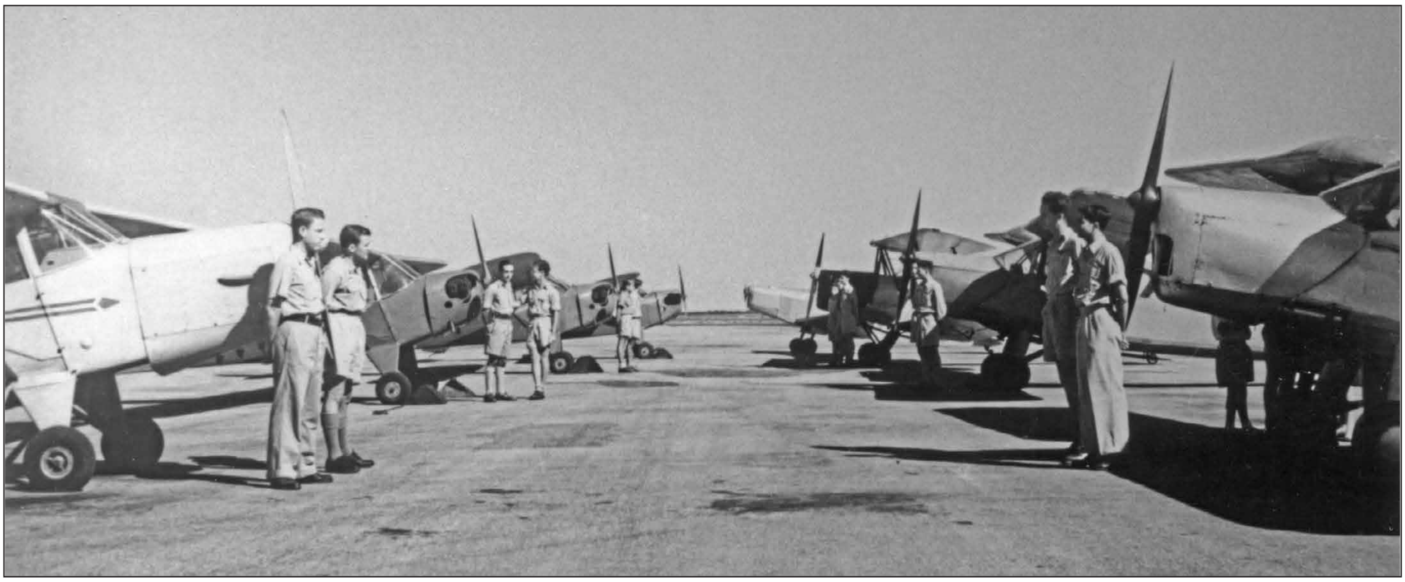
France embargoed further Frelon purchases, but the Americans sold the Sikorsky S-65 (military CH-53) to Israel. These were put to immediate use in commando assaults during the War of Attrition and then some tense search and rescue operations during the 1973 Yom Kippur War. Its importance ensured retention for half a century (a 114 Squadron machine pictured) through two major rebuilds, but was in need of replacement by 2021. (Ofer Zidon Collection)



The twin-engine Bell 212 began replacing the 205s in 1975 and lasted almost 30 years. Apart from airborne assault, like the 205s, they also performed search and rescue and training duties. This late-service 124 Squadron machine displays many of the defensive measures added such as flare/chaff dispensers, IR jammer, and radar warning receivers. (Ofer Zidon Collection)

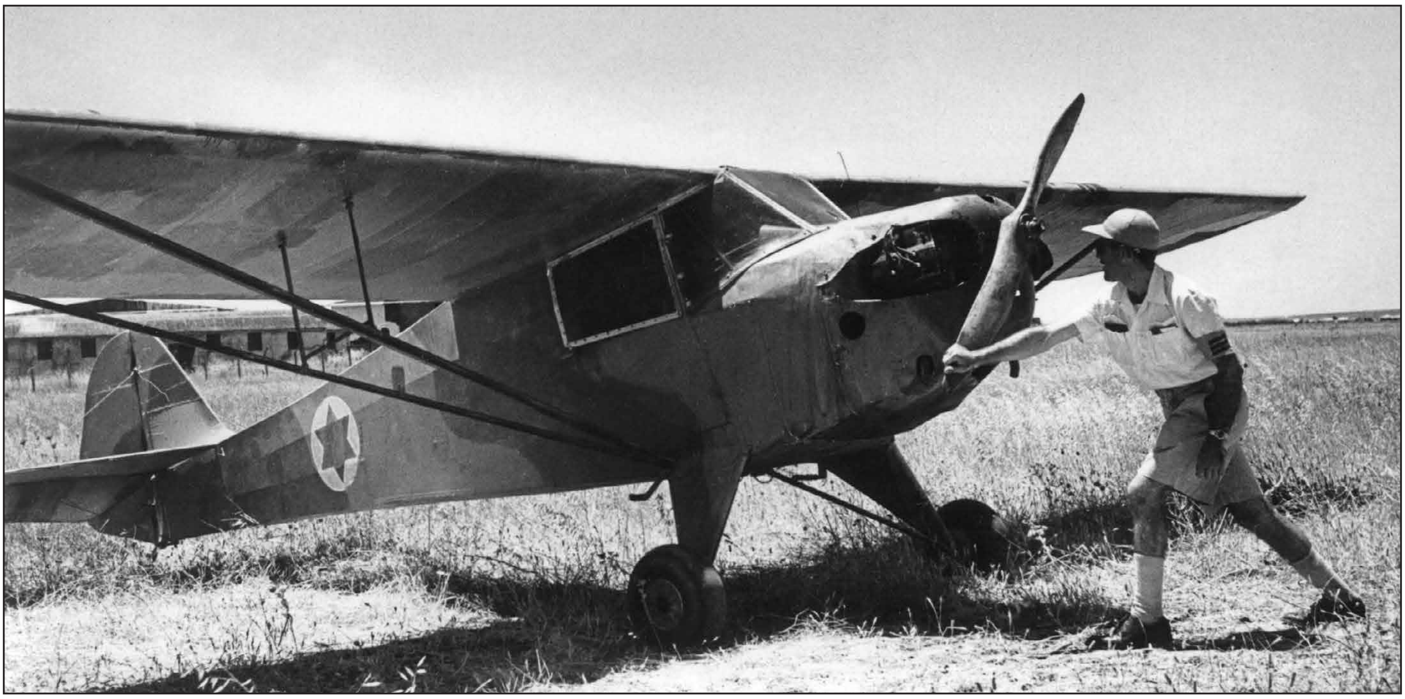
The IAF long lusted after the Black Hawk, but it was 1994 before the service finally took delivery of ten second-hand UH-60As. Subsequent purchases were UH-60Ls or equivalent, displacing the Bell 212s in 2002. Israel spent considerable resources to make theirs possibly the best protected Black Hawks anywhere with many warning and self-protection systems as suggested by the numerous "warts" applied to this example. (Israeli Air Force)

LIGHT TRANSPORT/LIAISON

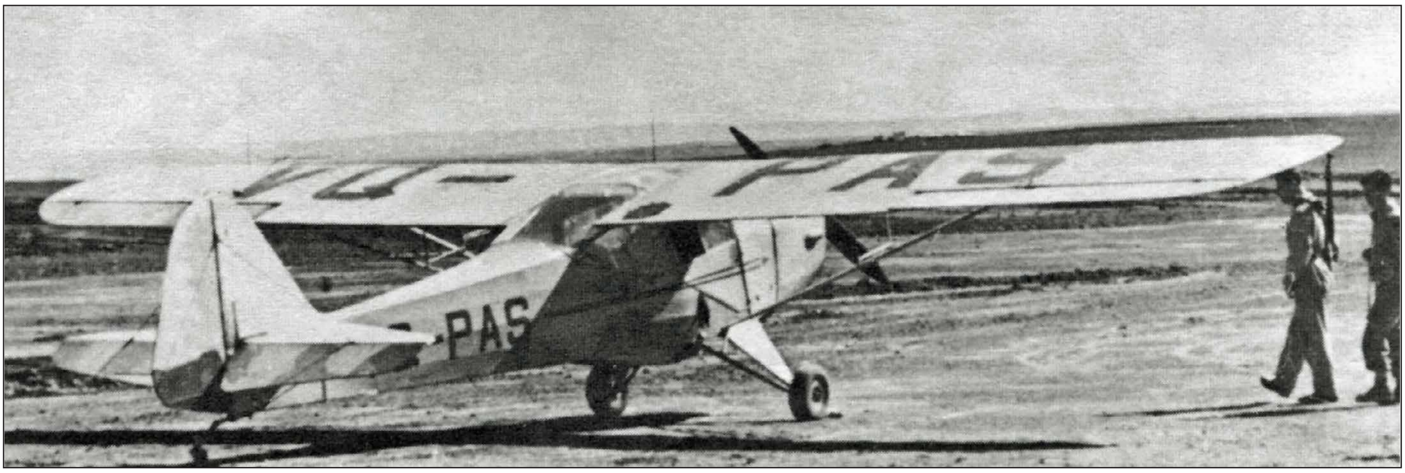


As war approached in Palestine, the Jewish community had light sport planes and some commercial assets they had been using for covert paramilitary work. Photographed at Lydda on October 25, 1947, were those aircraft belong to Aviron – The Palestine Aviation Company. At, right, from front to back, are two RWD-13s, a Tiger Moth and, at the end of the line, a Benes-Mraz Be.550 Bibi, while at left is an Auster J/1 Autocrat and three Taylorcraft. (Author's Collection)

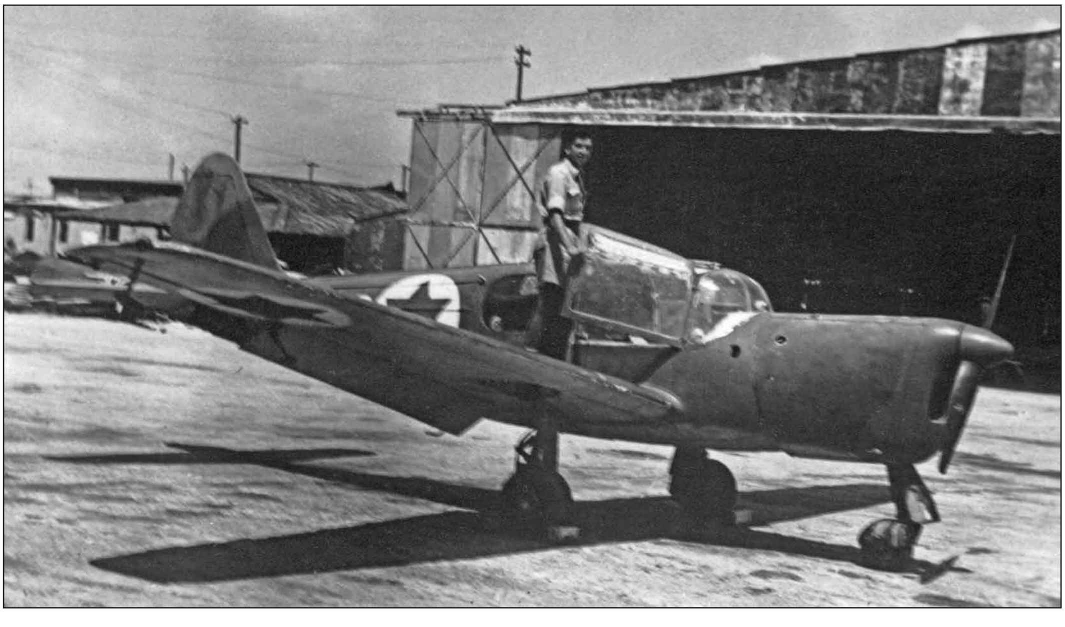
In the early pre-state period, as the region heated up, the light-plane fleet became more active. Aircraft were employed in scouting, liaison, casevac, cargo delivery, photography, and even attack. In the foreground of this image are the two Tiger Moths, the rear dark one with the sliding cockpit canopy, and in the background an R.W.D.-13. (Author's Collection)



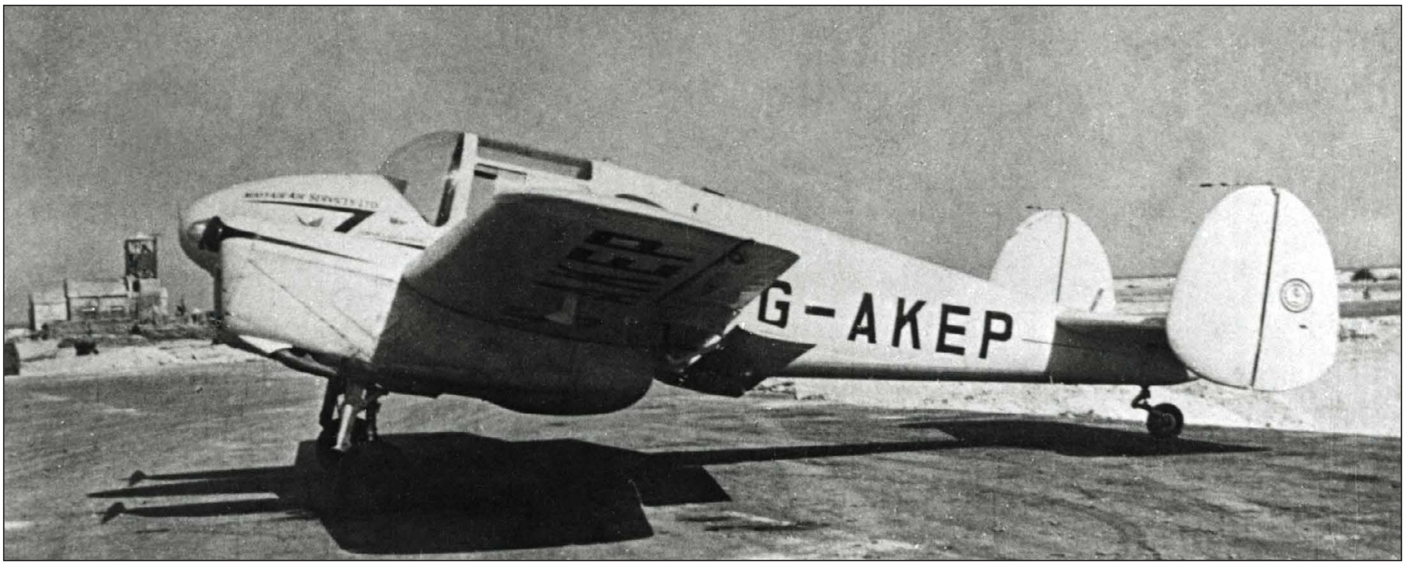
One of the Israelis' two Taylorcraft is seen in typical 1948 war operational conditions. These had been in Palestine since 1938 and 1939, and had been much used beyond their original sport plane origins. They continued to be worked hard with one damaged in a landing, but not repaired, and the other retired to a mechanics' school. (BIAF – Israel Aerospace Magazine)



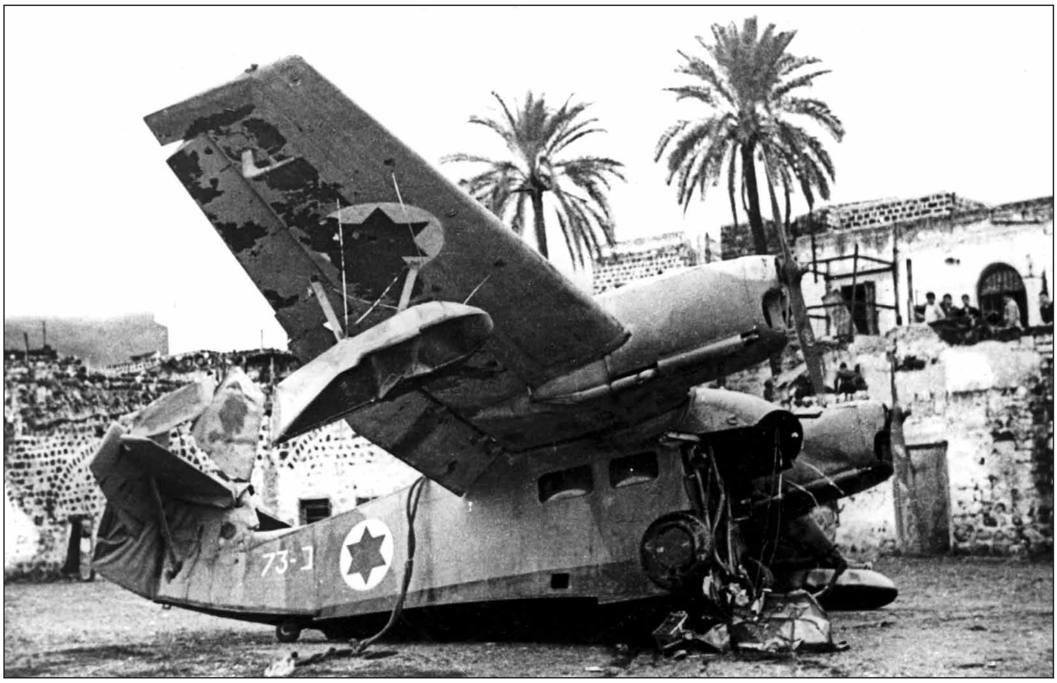
A British equivalent of the Taylorcraft was the Auster Autocrat. The sole IAF example predated the war and was also employed in patrol, photo reconnaissance, and light transport into hazardous areas. It appears to have survived the war, but its exploits were subsumed in the larger Auster fleet. (BIAF – Israel Aerospace Magazine)



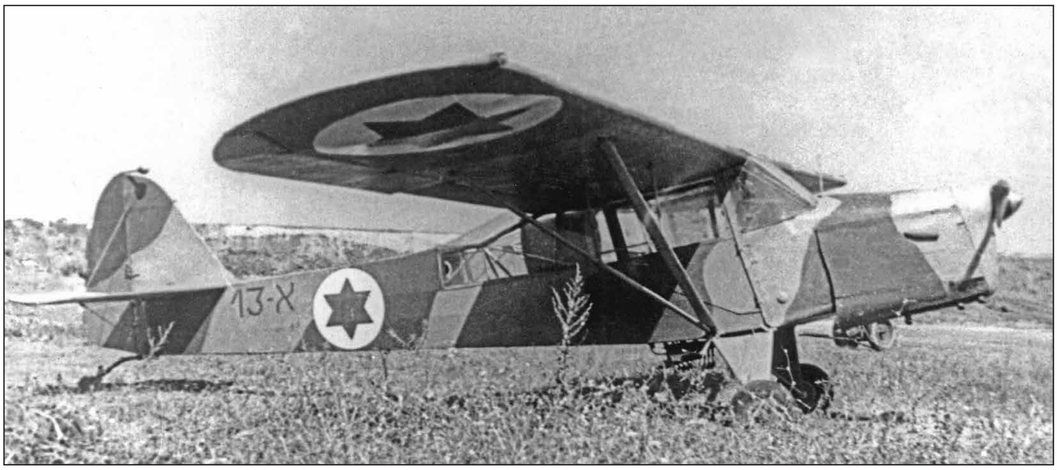
Donated by a French Jewish family, the two Nord Norécrins joined the motley collection of light-planes to fight a war in 1948. They were largely devoted to air ambulance duties when it was found that a stretcher could be lifted across the wing into the cabin through the wide door. The pair survived the war and were sold off with many of the other disparate types to converge on a rational inventory. (BIAF – Israel Aerospace Magazine)



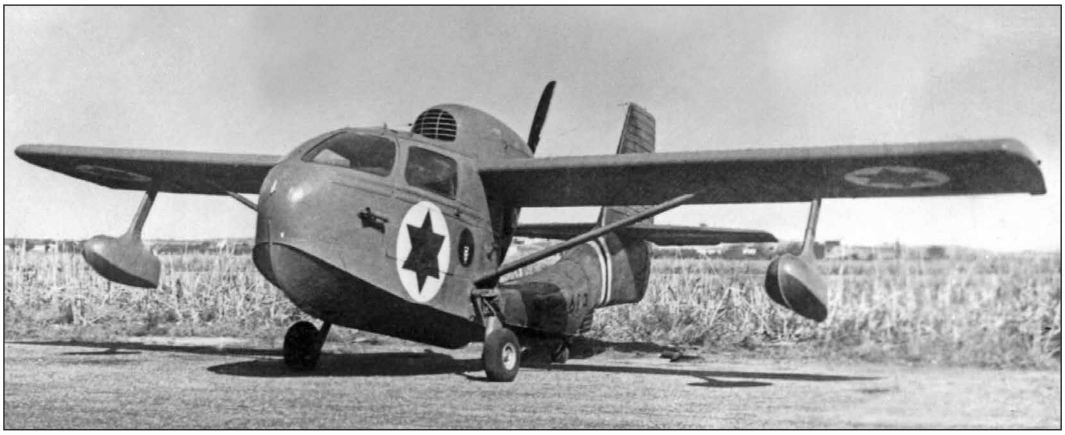
The Miles Gemini was among the mish-mash of odd types brought into the country before and during the War of Independence. Its value in a war zone was minimal and it was never formally taken up as a military airplane. Instead, it remained a government asset employed in support of the Dead Sea Potash Industries and mostly flew into and out of the nearby Sedom strip until damaged in July 1948. (BIAF – Israel Aerospace Magazine)



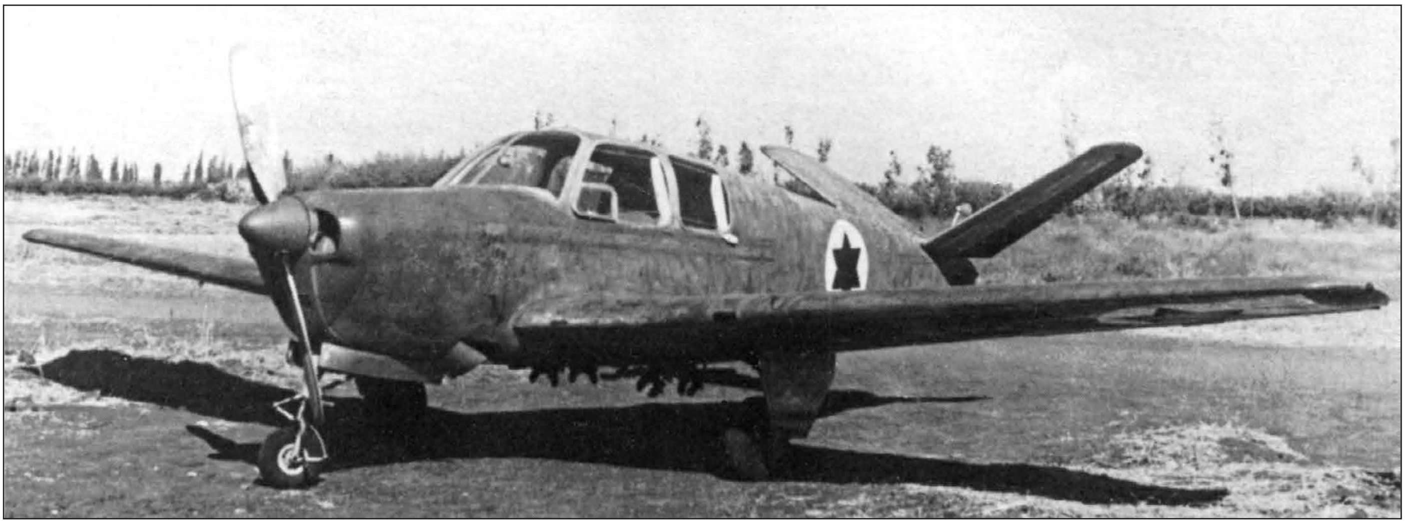
Another marginally useful type was the Grumman Widgeon of which two were smuggled into Israel. One was destroyed on December 7, 1948, during practice water landings with four fatalities, with this image showing the wreckage recovered from Lake Tiberius. The second served on in liaison duties until 1952. (BIAF – Israel Aerospace Magazine)



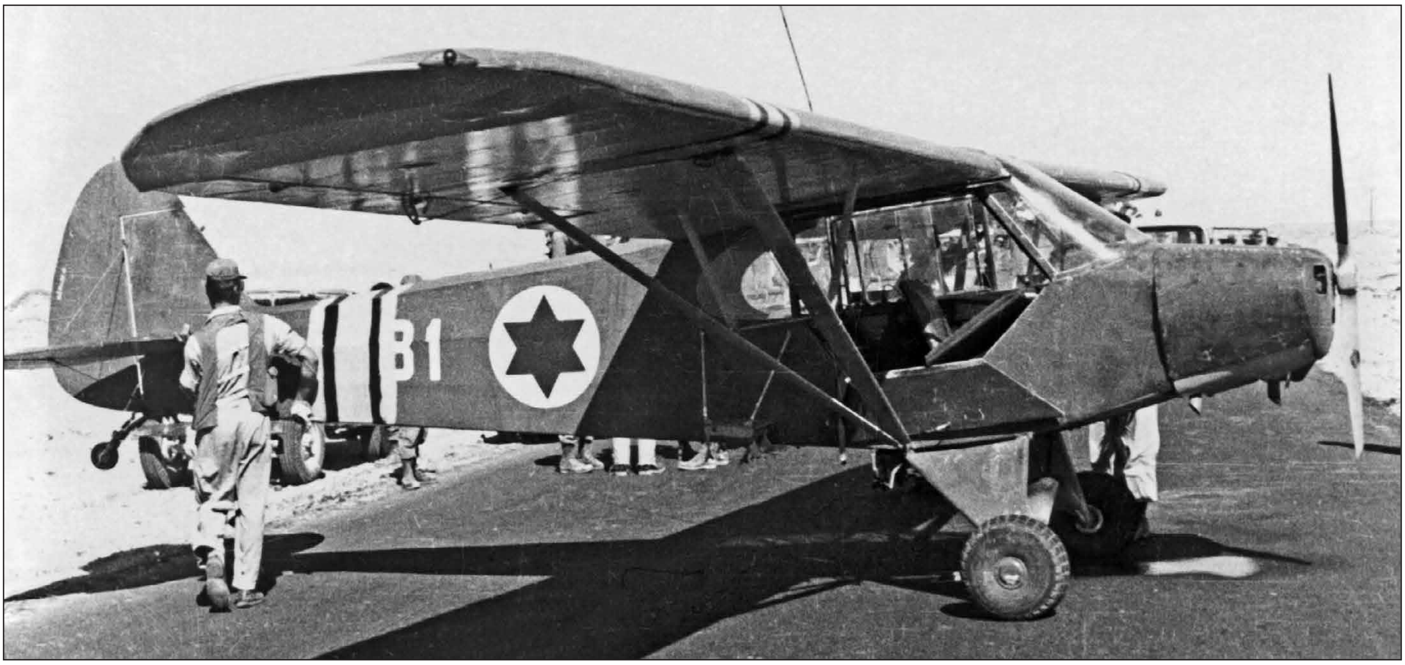
Preparing to evacuate Palestine, the Royal Air Force sold as scrap 20 Auster Air Observation Post (AOP) light-planes. The local Aviron company served as a front to purchase the wrecks which were then restored to flight with various degrees of difficulty. Two of these were AOP.3s that took on the identity of the Autocraft and the rest AOP.5s that masqueraded as Taylorcraft until declaration of the state, after which they were formally militarized. (BIAF – Israel Aerospace Magazine)



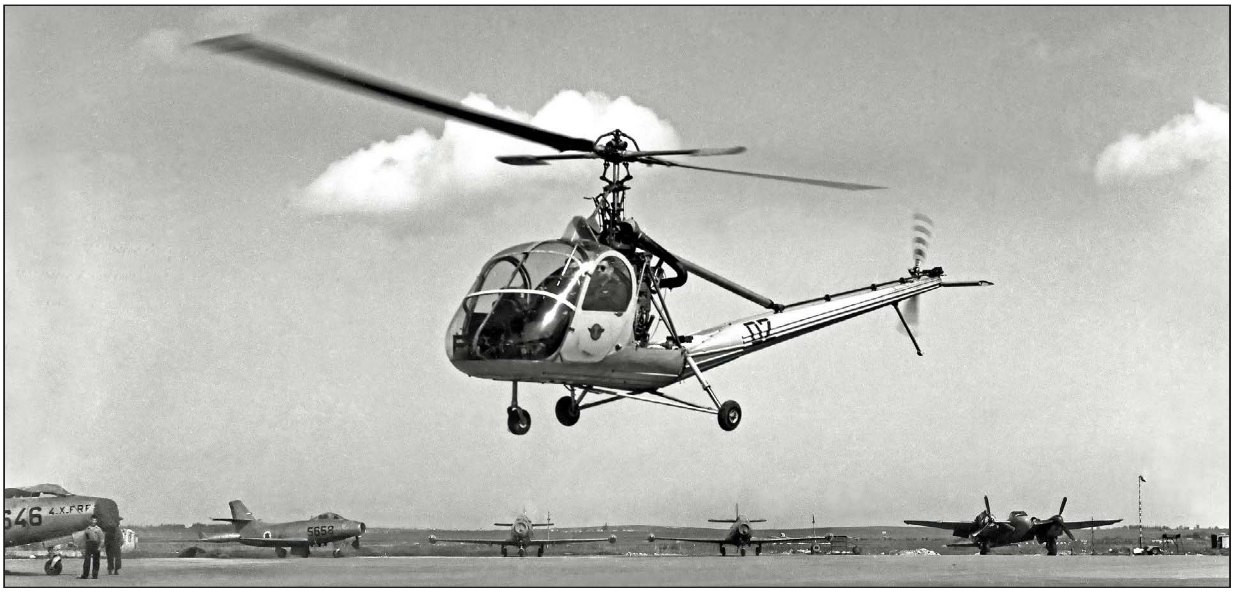
The Republic Seabee seaplane was another aircraft that predated the state and had been used by the Haganah. Its aquatic capabilities were of almost no value, and the aircraft's design made it unsuitable for many of the rough fields the other light-planes were operating from. It was damaged by enemy action and mishap several times yet survived the war. (BIAF – Israel Aerospace Magazine)



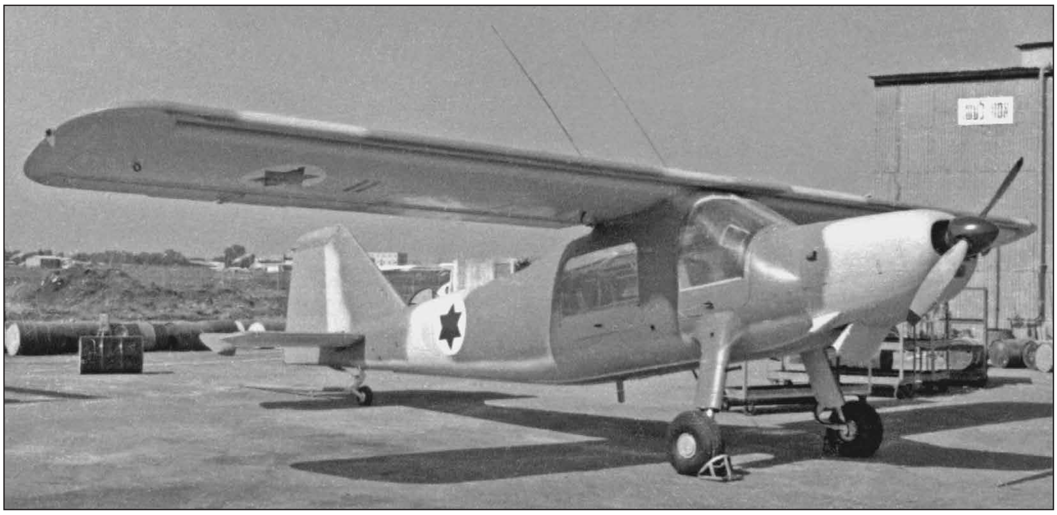
Three Beech Bonanzas were flown to Israel from The Netherlands and South Africa in 1948, and a fourth arrived following the war. The initial trio contributed more than their appearance would have suggested, to include bombing with a rack installed on the belly. Three were retain after the war until sold in 1953. (Author's Collection)



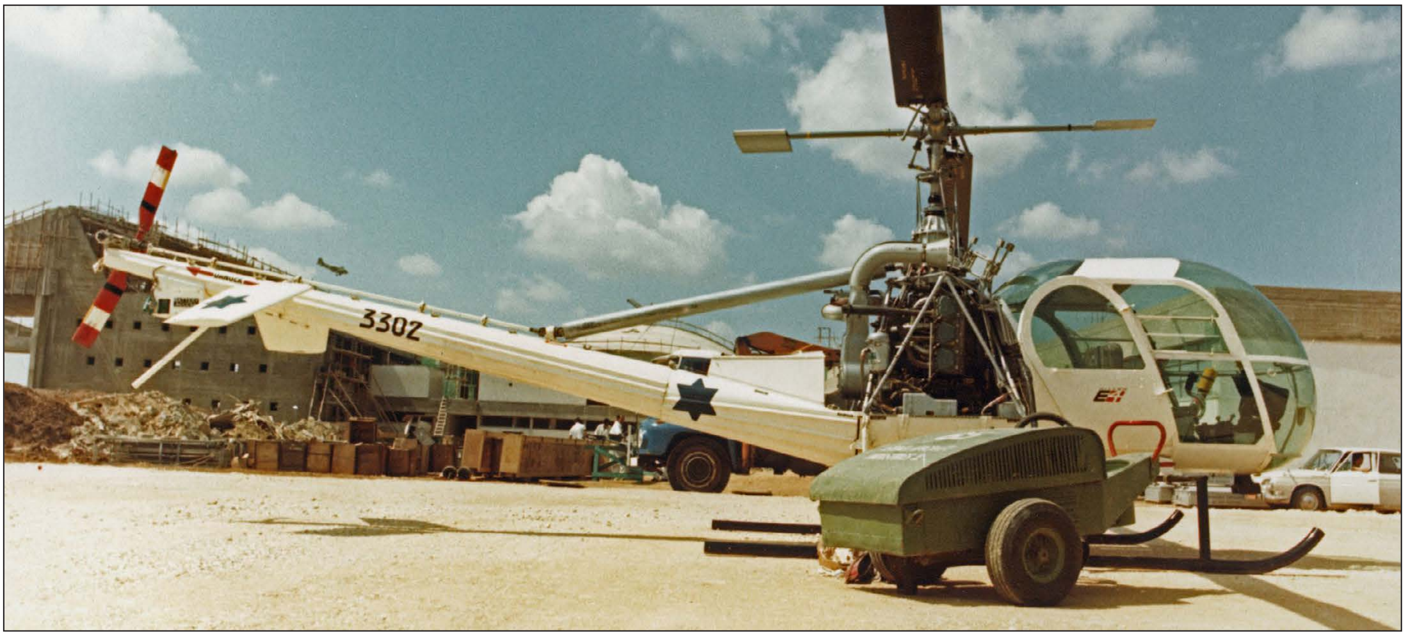
Possibly Israel's first purchase of new aircraft was 20 Piper PA-11 Cubs that were brought on line late in the War of Independence. Following the war, the Cub became the standard light-plane and used for all manner of tasks to include bombing, strafing, casevac with a litter fitted inside, search and rescue, patrol, spotting, flight training, and general liaison. This example is being turned around after landing on a road in the Sinai during the 1956 war where it was employed in rescuing downed pilots, and carrying commanders aloft to view the battlefield and communicate via radios (note the tall antenna atop the airplane). (BIAF – Israel Aerospace Magazine)



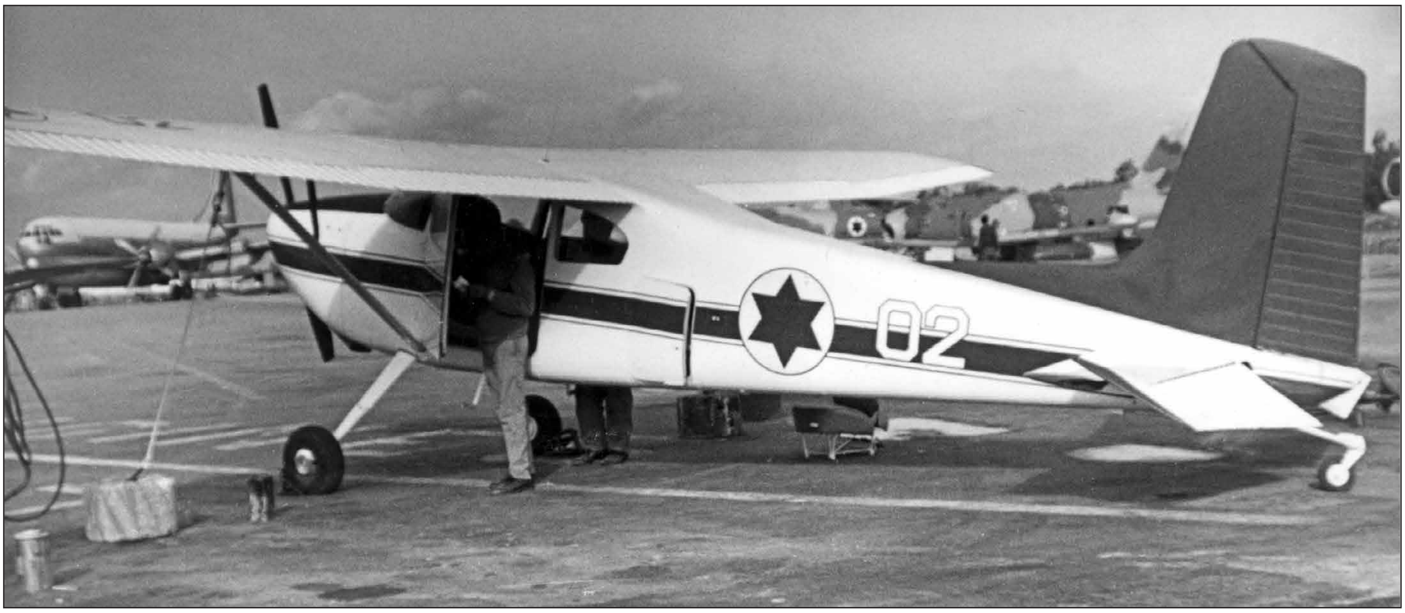
The experience of reaching remote settlements during the 1948 war led Israel to look at helicopters. The Hiller 360 was one of the first light rotorcraft on the market and the IAF acquired two used machines in 1951 to gain familiarity. These had low military value and were usually in poor condition, seldom having both flightworthy simultaneously. Yet, one survived until 1959. (Ra'anan Weiss Collection)



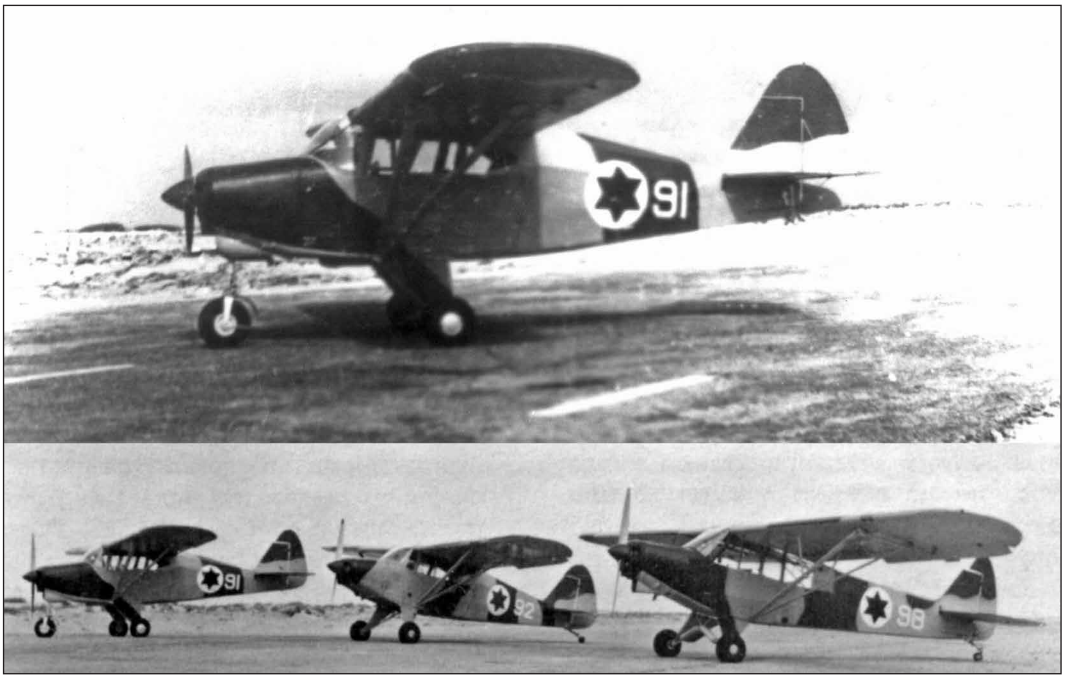
The secret reparations from West Germany including buying Israeli goods while supplying non-lethal equipment and light arms. This included a dozen Dornier Do.27 with respectable short takeoff and landing performance, rugged construction, and generous interior volume. These proved so valuable that additional examples were acquired for a total 34 Do.27s serving through 1982. (BIAF – Israel Aerospace Magazine)



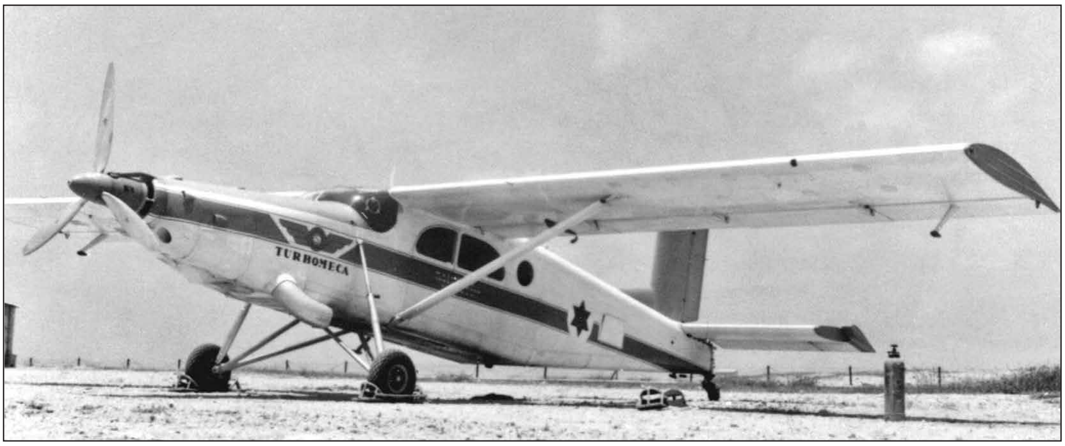
An additional Hiller helicopter obtained by the IAF was a UH-12 seized at Egypt's Abu Rodeis oil fields in 1967. It was pressed into service, initially for military purposes and then used in the same manner as the former owners when Israel chose to operate the Abu Rodeis facilities and consume the oil. Hence, the aircraft was principally operated commercially and returned in 1976 as part of the peace settlement with Egypt. (BIAF – Israel Aerospace Magazine)



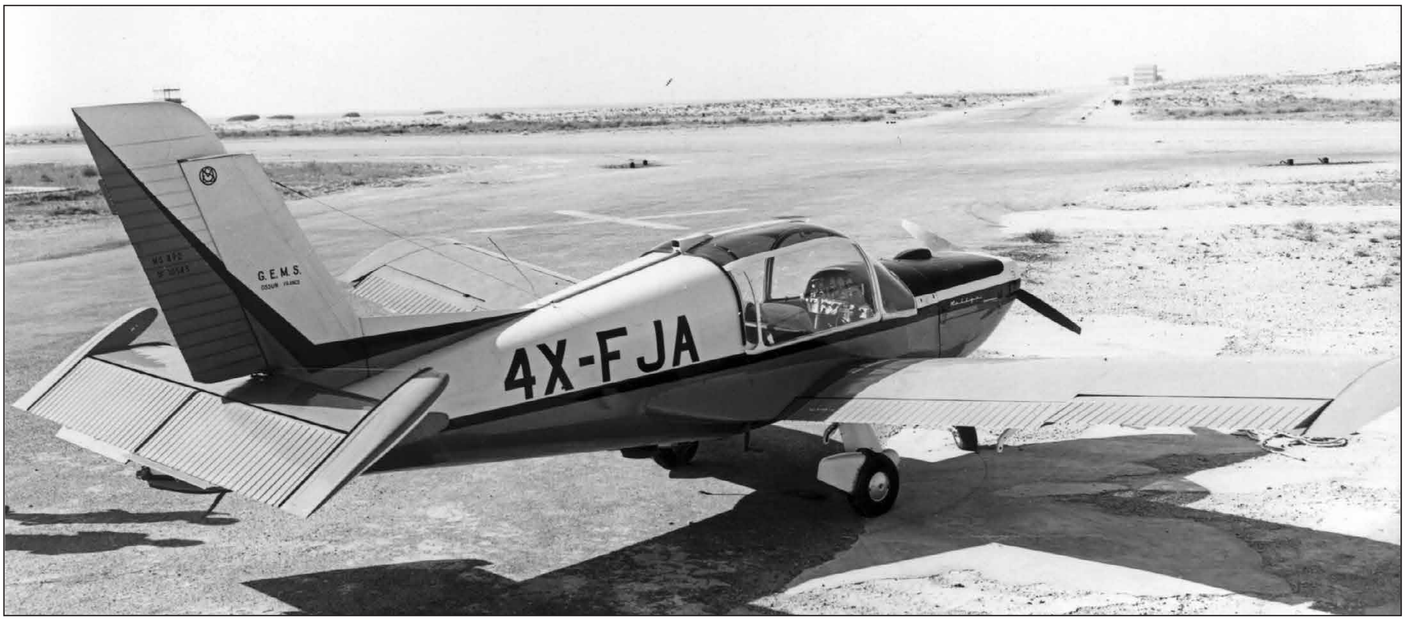
Two Cessna 180s came to the IAF via the Israeli police that gave up air operations in 1966. The air force operated the pair from 1967 through 1982 in the liaison role. By 1982, with the Sinai gone and threats receding, the service was working to consolidate to a fleet with fewer types. (BIAF – Israel Aerospace Magazine)



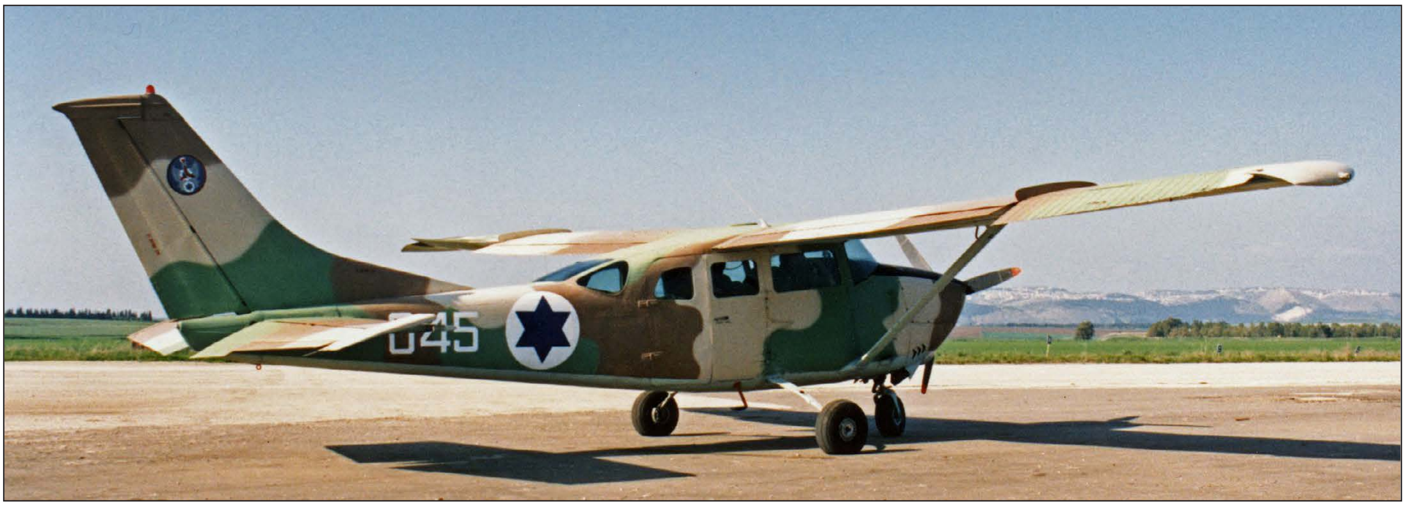
Two Piper PA-20 Pacers, operated by the Police, were mobilized for the 1956 war. One was lost immediately after, while still operated by the Air Force, and replaced with a tricycle-gear PA-22 Tri-Pacer. This image shows the the surviving Pacer and the Tri-Pacer in the company of a Cub, after the Police machines were transferred to the IAF in 1959 where they served until 1966 with 100 Squadron. (BIAF – Israel Aerospace Magazine)



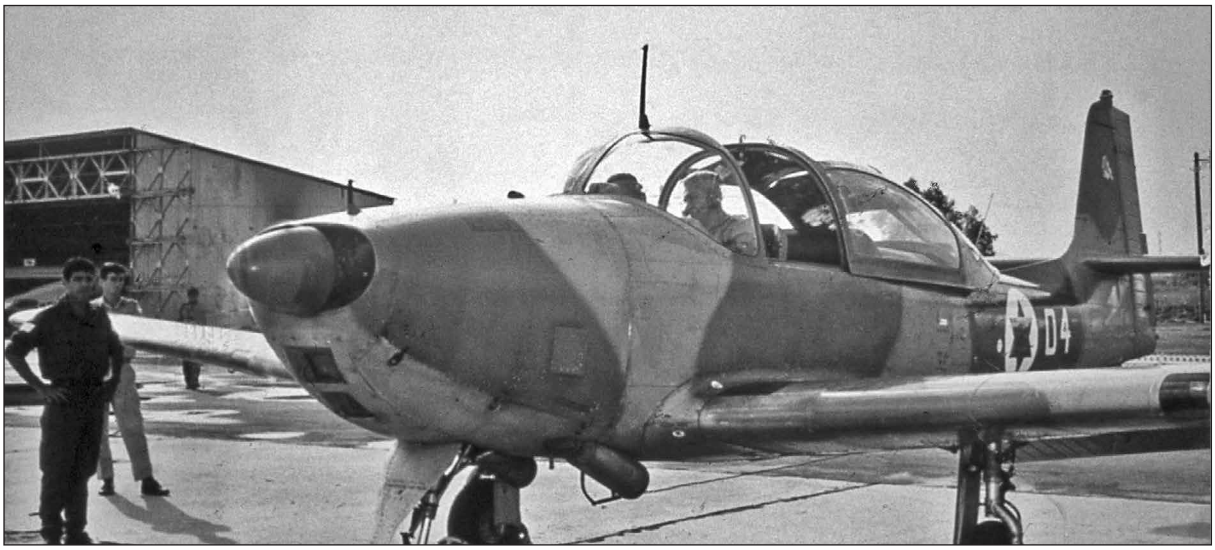
A Pilatus Turbo-Porter was brought to Israel in 1963 for a demonstration and left such a good impression that it was bought on the spot. It possessed fine off-field capability and outstanding high density altitude performance, so when the first was lost (aircraft 02, shown), a second was purchased. This sole example served until 1973. (BIAF – Israel Aerospace Magazine)



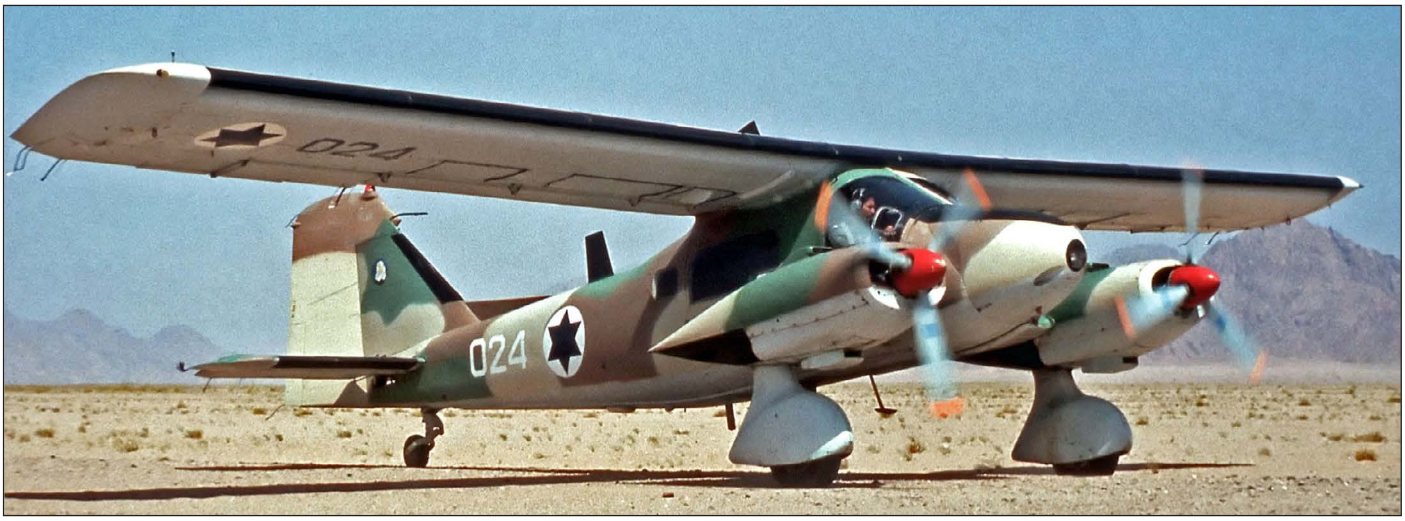
The SOCATA Rallye was a gift from the French aircraft industry, coming to Israel in 1965. It was well liked and used by senior commanders for getting around the country. The sole example was let go in 1973 after being gravely damaged. (BIAF – Israel Aerospace Magazine)



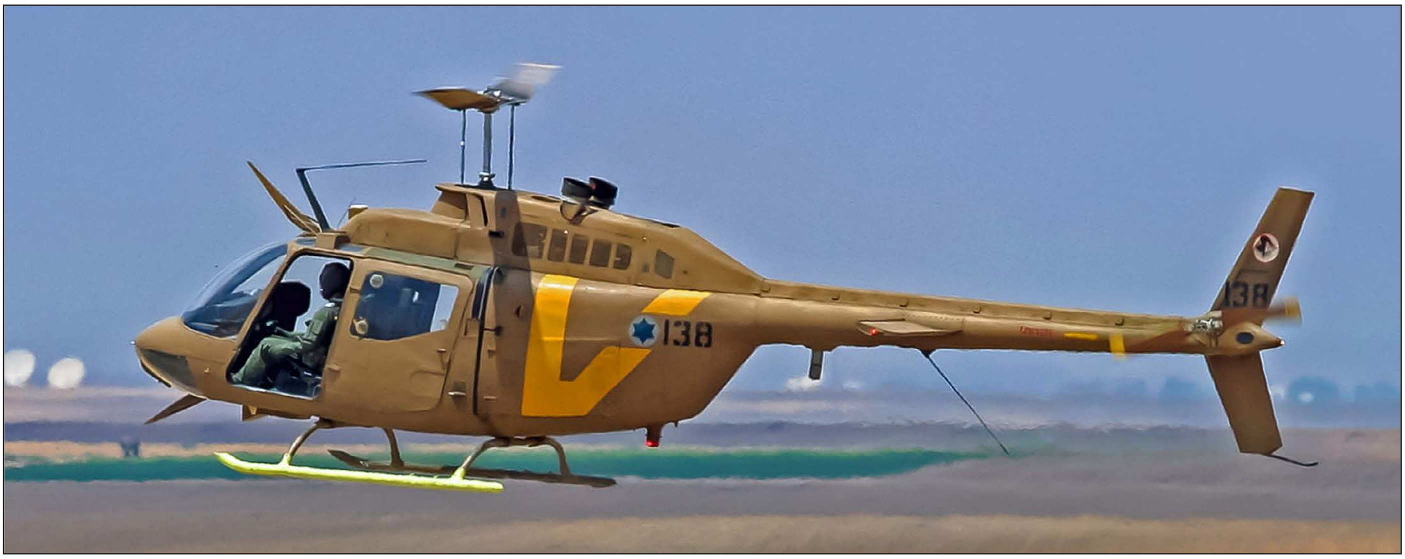
Following the Six-Day War, with the need to fly to many remote sites in the Sinai, the IAF found itself short of liaison aircraft. It purchased 30 Cessna U206. Super Skywagons Stationairs between 1968 and 1970, and an additional six were bought in 1984 to replace attrition losses. They became a standard single-engine liaison type through 1997, this example displaying the badge of 8 Wing, Tel Nof AB. (BIAF – Israel Aerospace Magazine)



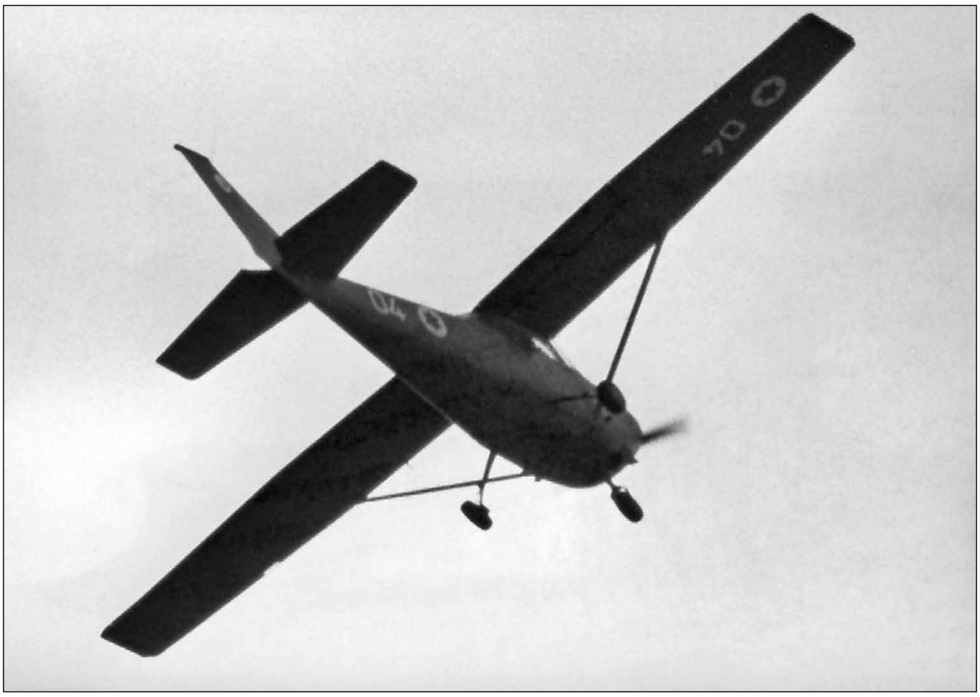
Three Piaggio P.149Us were in the employ of the Ugandan Air Force when the IAF assisted in flight training in that country. By 1968, when this arrangement ended, the airplanes became the property of Israel and were transferred. There they were used for general liaison duties by 100 Squadron, with one lost, until withdrawn in 1970. (Shlomo Aloni Collection)



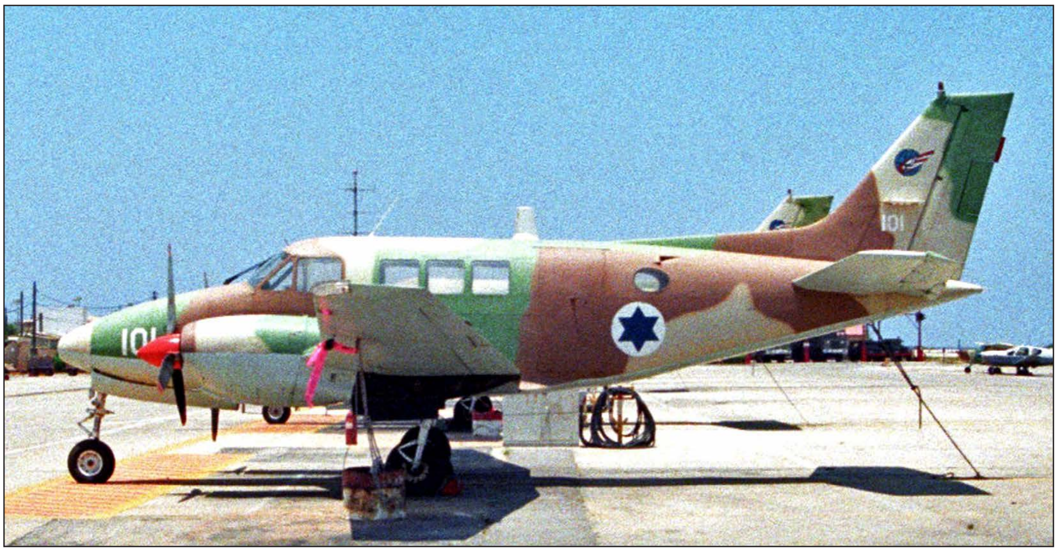
The Do.27 experience was so favorable that purchasing the derivative twin-engine Dornier Do.28 was a relatively easy decision. More than two dozen were taken on beginning in 1971, and they were kept until 2005 as the last “taildraggers” and with fabric-covered control surfaces. This 100 Squadron airplane taxis on a gravel runway in the Sinai during the Yom Kippur War. (Ra’anan Weiss Collection)



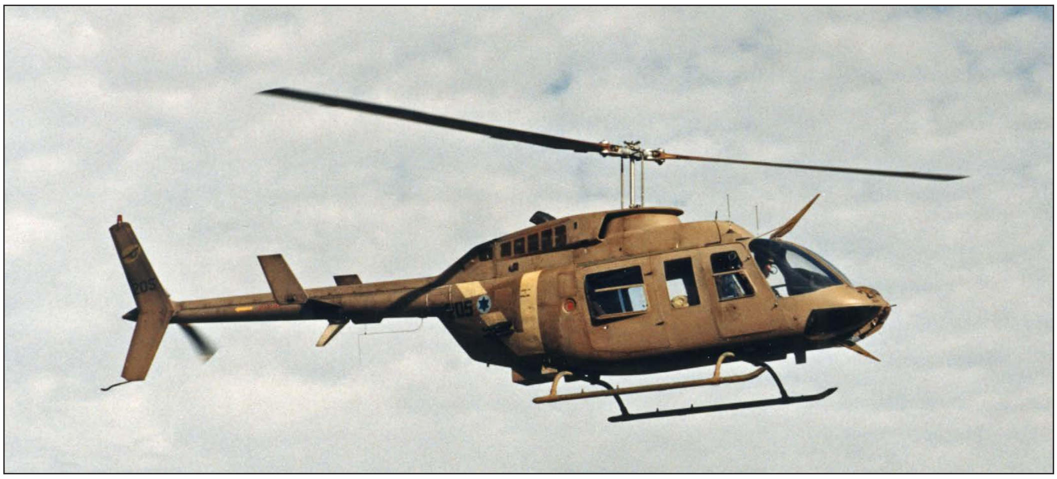
Growing its light helicopter fleet was fairly easy given American generosity in supplying equipment. Several buys of Bell 206 JetRangers and OH-58 Kiowas from 1971 totaled 42 aircraft. Apart from liaison duties, they were also employed in flight training as its final role as exemplified in this image with the flying school badge. (Israeli Air Force)



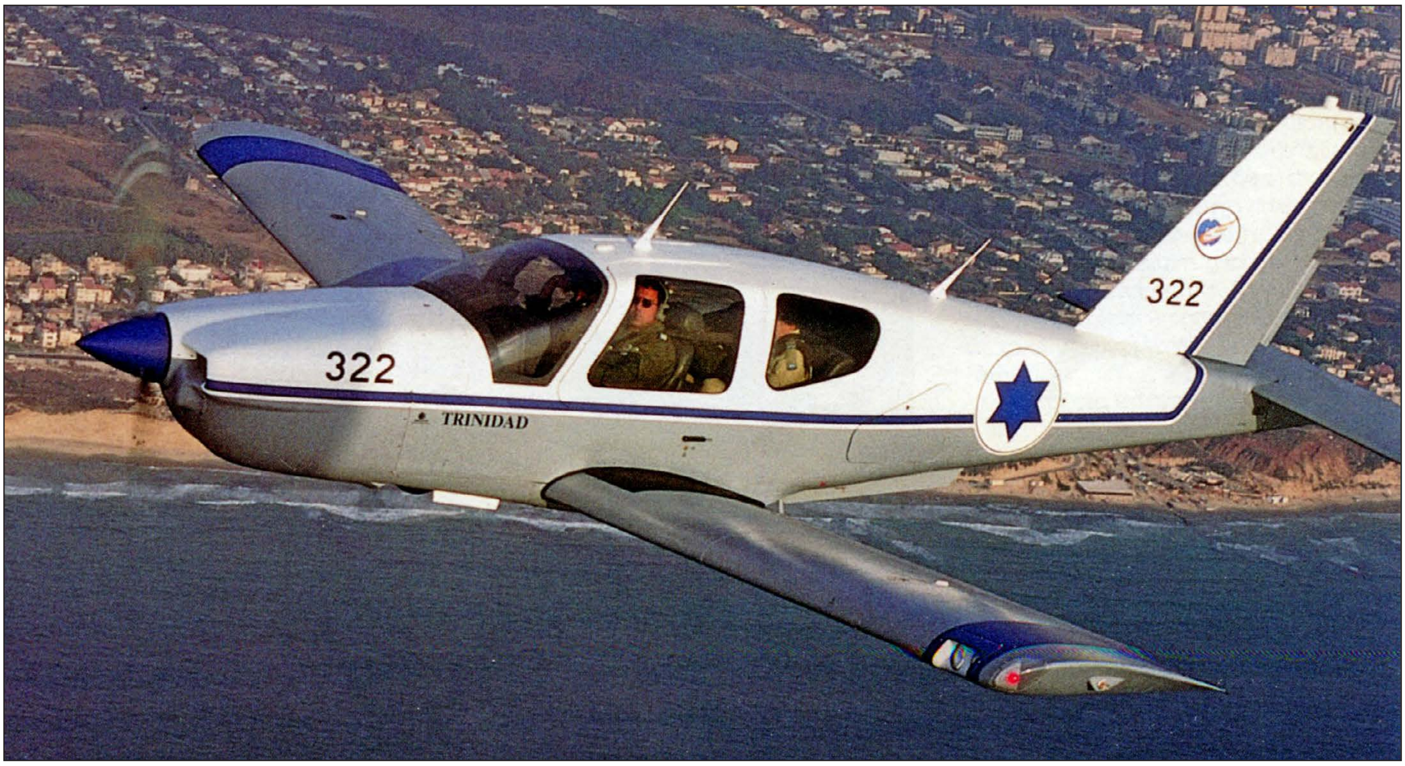
The two Cessna T-41s were acquired in 1974 to serve as systems and navigation trainers. However, they were assessed as unsuitable. Regardless, they continued to be used for navigation training and transport hacks until 1978 when they were let go. Photographs of the aircraft have proven elusive and this, of 04 in 4-tone camouflage, is the only one to come to light. (BIAF – Israel Aerospace Magazine)



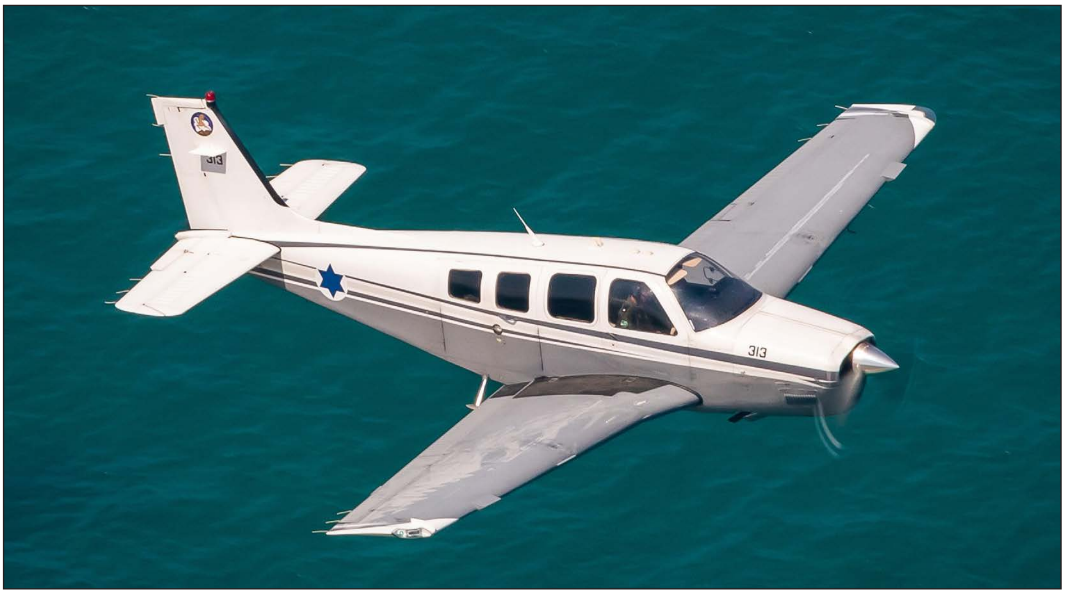
Augmenting the Cessna U206s with a dozen Beech Queen Air twins in the liaison role was a natural choice. Their vital role of transporting commanders to their units in an emergency meant they were fitted with the full instrument flight suite so that weather would be less an impediment. This 135 Squadron airplane is seen at Sde Dov in the company of Do.28s and Trinidads, probably near the end of its time in Israeli service during 2003. (Ofer Zidon Collection)



The light helicopter fleet was expanded again in 1984 with acquisition of the Bell 206L Long Ranger, accommodating more passengers or freight. Only six were picked up and so these were vulnerable in 2003 to being struck from the inventory to save operating budget. This 125 Squadron chopper has "grown" some added antennae and other external additions. (Author's Collection)

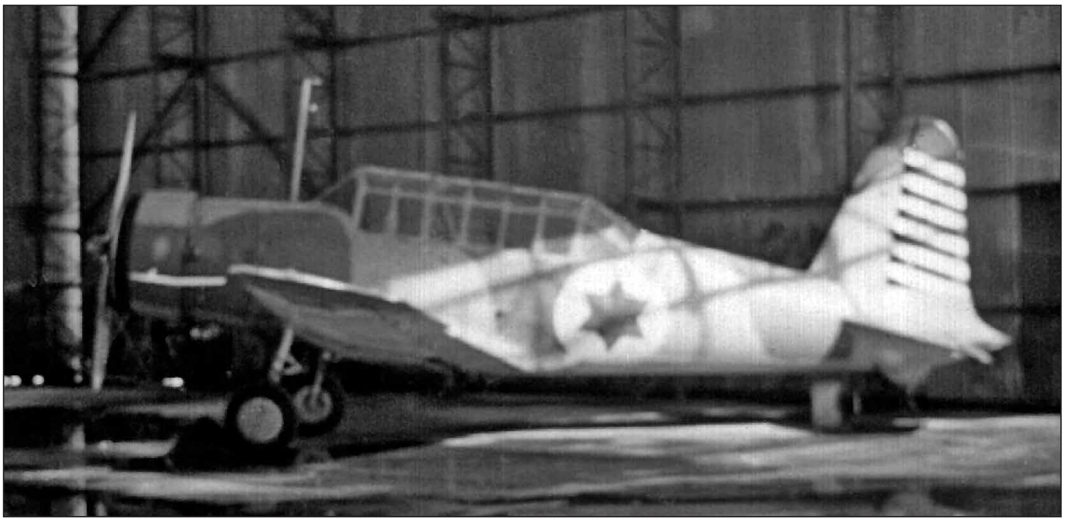


With the U206s growing old, a replacement was delayed by budget pressures until SOCTATA Trinidads were acquired in 1995 as one of the least costly alternatives. Marking the change in defense posture, these aircraft were not camouflaged. They were not popular and were sold off in 2005 after a comparatively short IAF career. (Israeli Air Force)

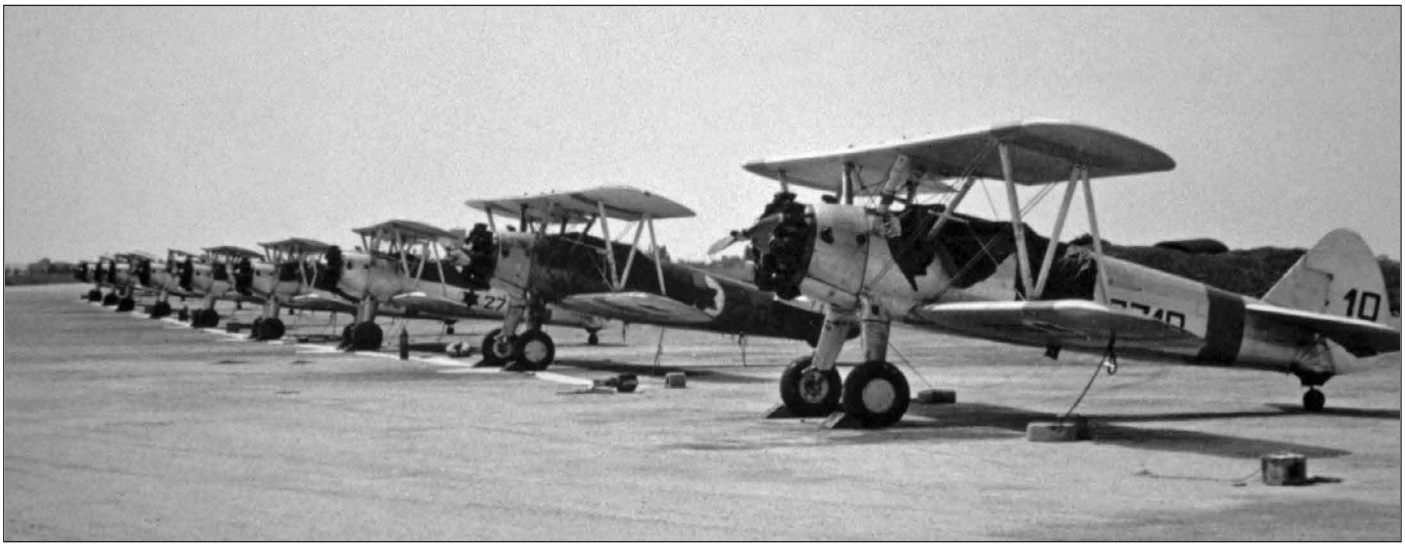


The IASF's first choice for liaison airplane had been the Bonanza when the Trinidad was selected. With the demise of the SOCATA, the Beechcraft was purchased in 2004. These also were not camouflaged. (Israeli Air Force)

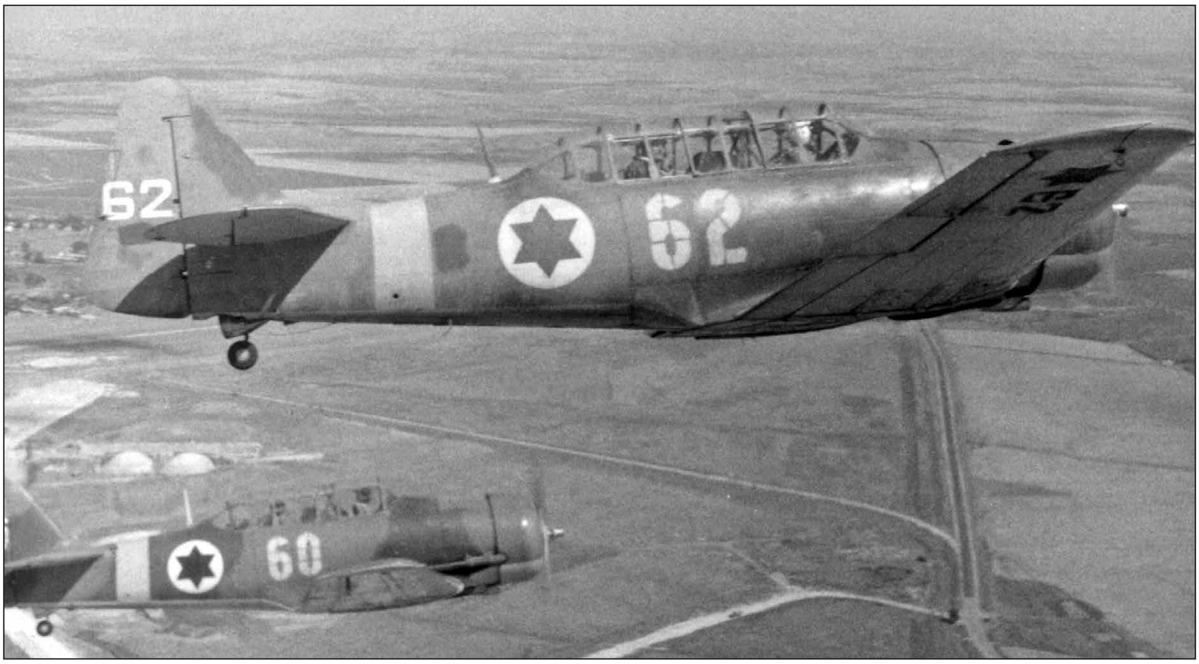
TRAINING (PRINCIPAL USE)



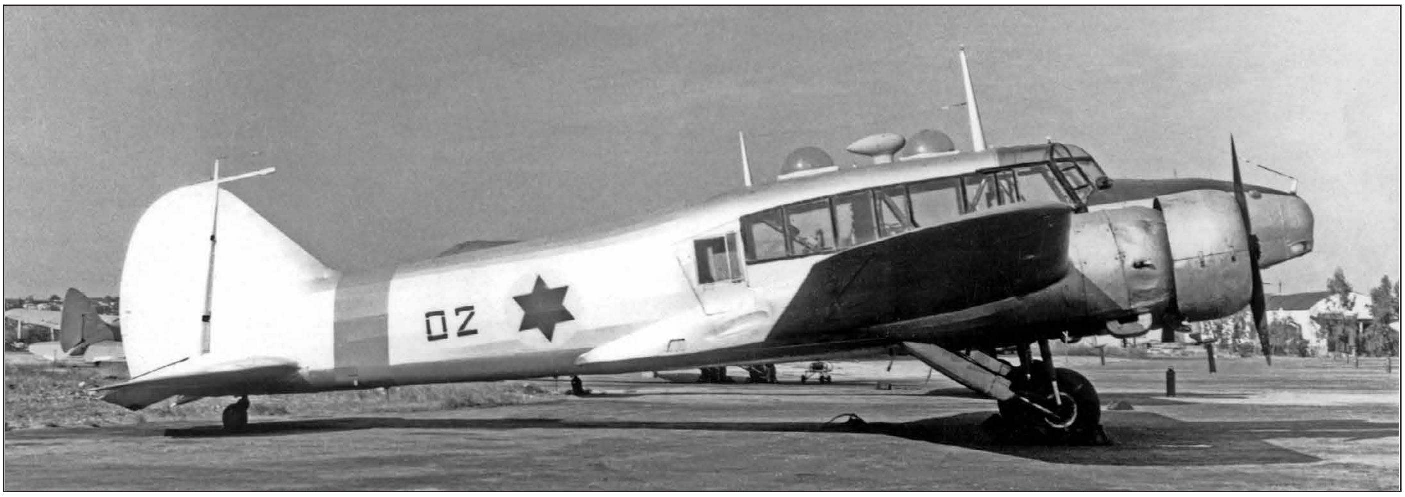
Two Vultee BT-13s were carried by C-46s en route to Israel. One ended up at the Czech field from which the munitions airlift was performed, used as a trainer. The other Valiant was employed in Israel for like purpose (shown at a damp Qastina), plus liaison work, until damaged and eventually written off. The aircraft in Europe was delivered to Israel when the airlift folded, but never operated. (Ra'anan Weiss Collection)



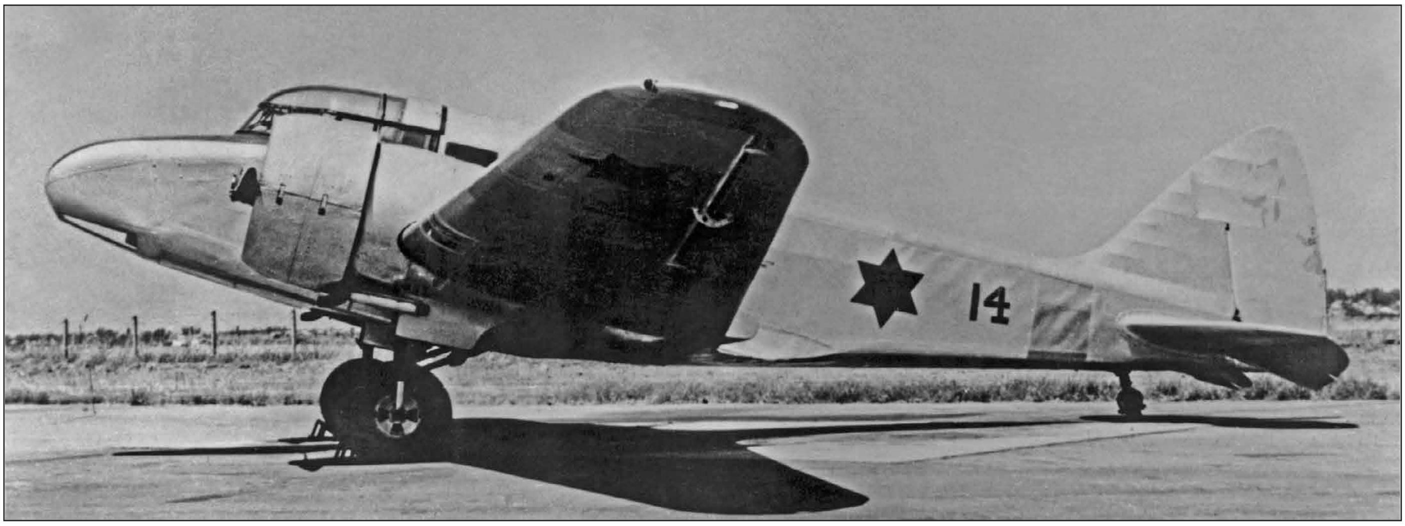
The Boeing-Stearman Kaydet was employed in a combat role during 1956 and did liaison hack duties when called, but was principally a primary trainer. Although efforts were made to replace the canvas-covered biplane, it soldiered on until 1962 when it was replaced with the jet Fouga Magister. (Shlomo Aloni Collection)



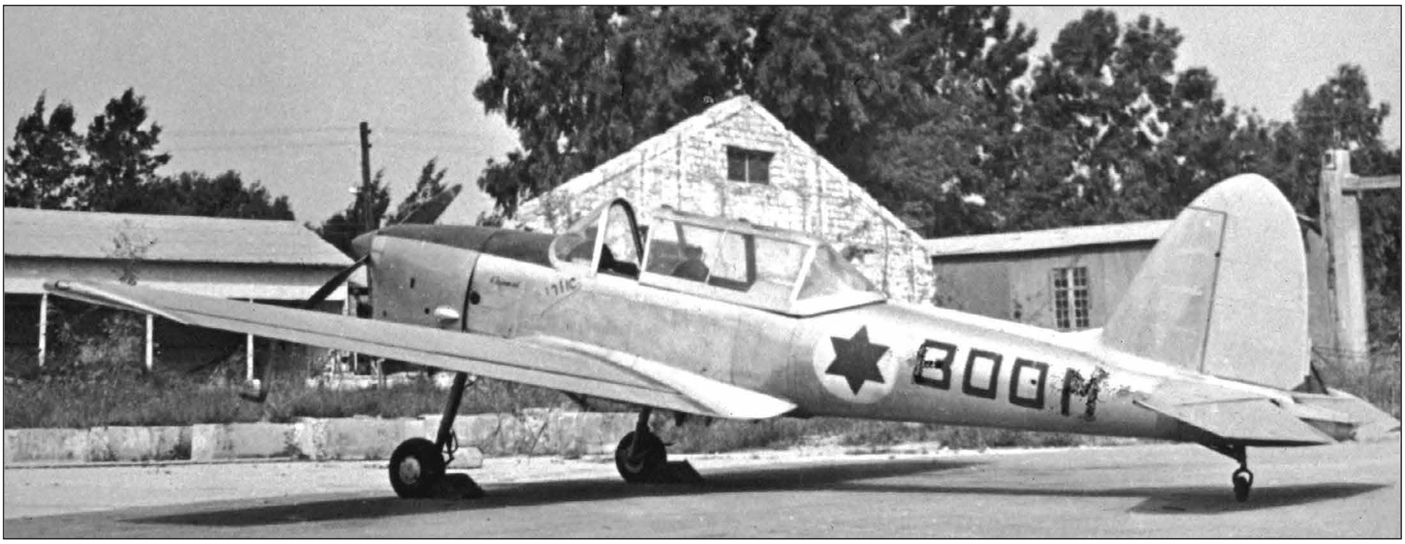
The North American AT-6 was sought for its dual role as an attacker and trainer. Called the Harvard by the Israelis, it did perform some combat in 1948-1949 and 1956, but served primarily as an advanced trainer. It was replaced by the jet Magister but did not disappear from flightlines until 1963. (Author's Collection)



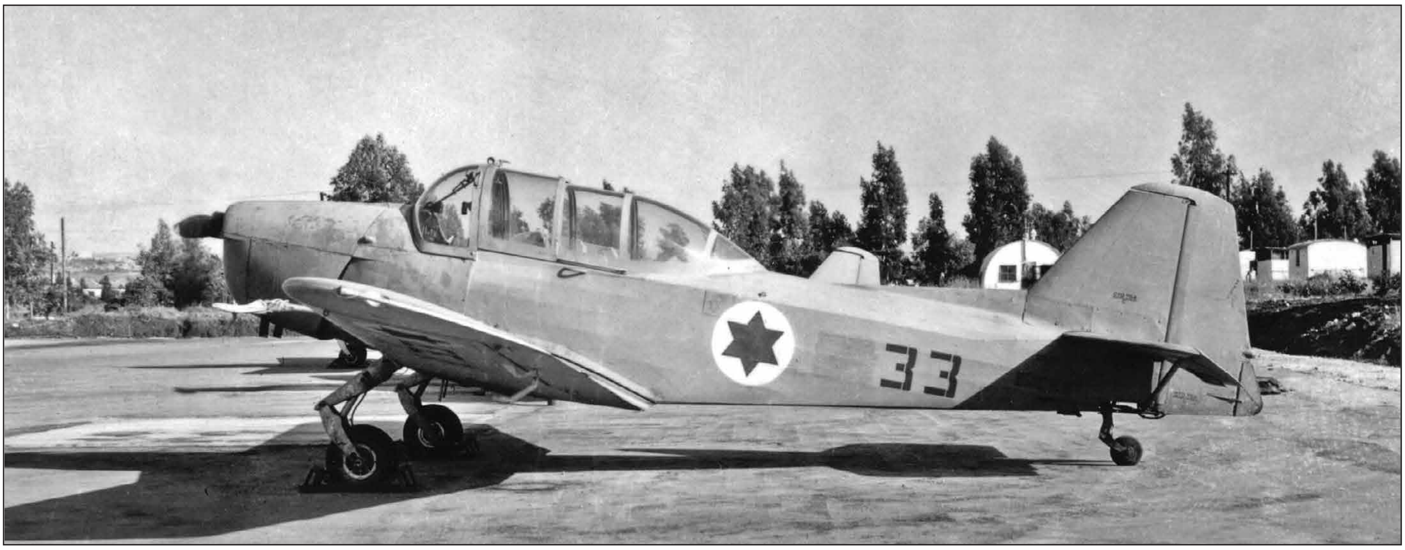
The Avro Ansons from the Second World War were a good transport aircraft, readily available, and the Israelis acquired several. They were employed in general transport and training, but eventually came to consume a great deal of maintenance attention. That such aircraft had to be operated until 1956 underlines the low funding for the service during this period. (BIAF – Israel Aerospace Magazine)



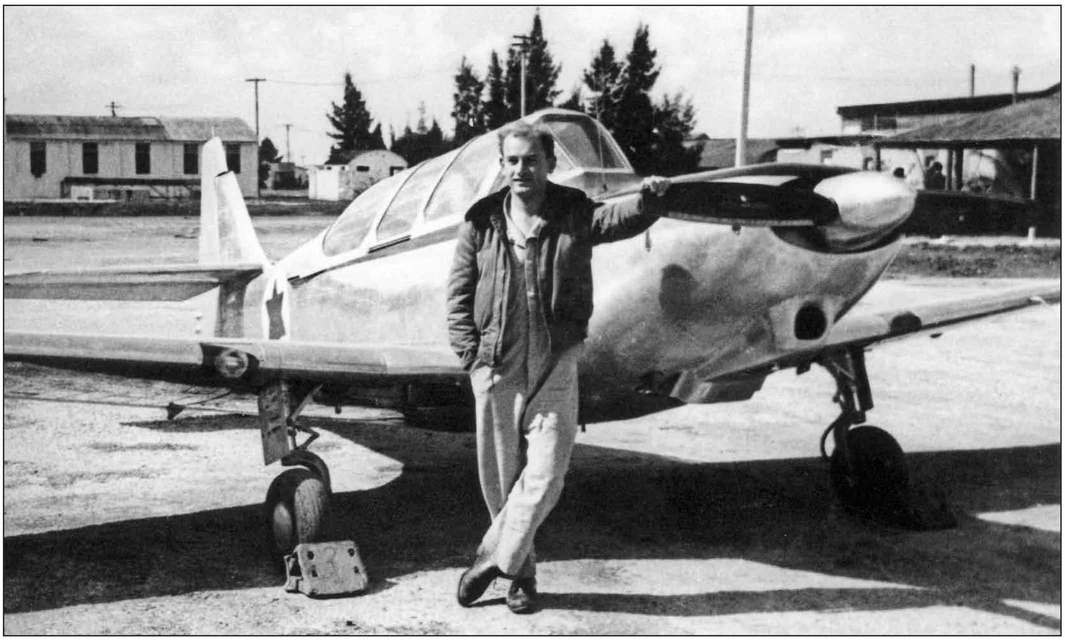
The Airspeed Consul, and its twin the Oxford, were other British transports from the world war that were readily picked up by the Israelis. Like the Anson, these decayed rapidly to atrocious serviceability rates. However, their training and transport roles were important enough to suffer their poor condition until after the 1956 war. (BIAF – Israel Aerospace Magazine)



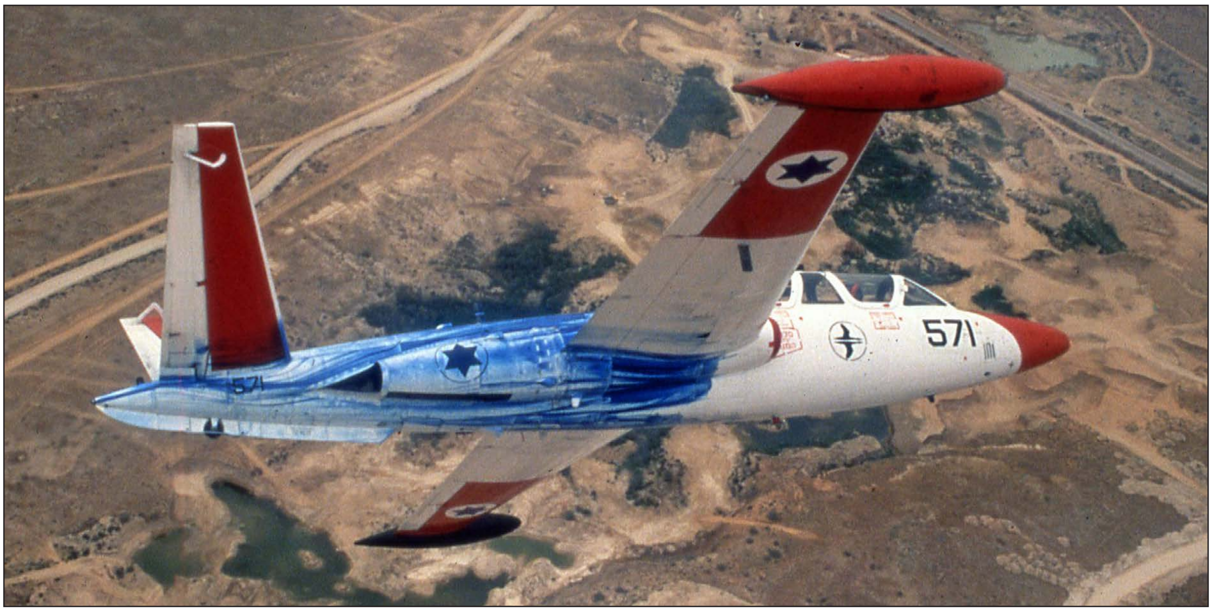
The de Havilland Chipmunk were among the aircraft evaluated to replace the Stearman. Another trainer was selected before the testing in 1950 was completed. The sole Chipmunk lingered on into 1953 before being sold in 1956. (Shlomo Aloni Collection)



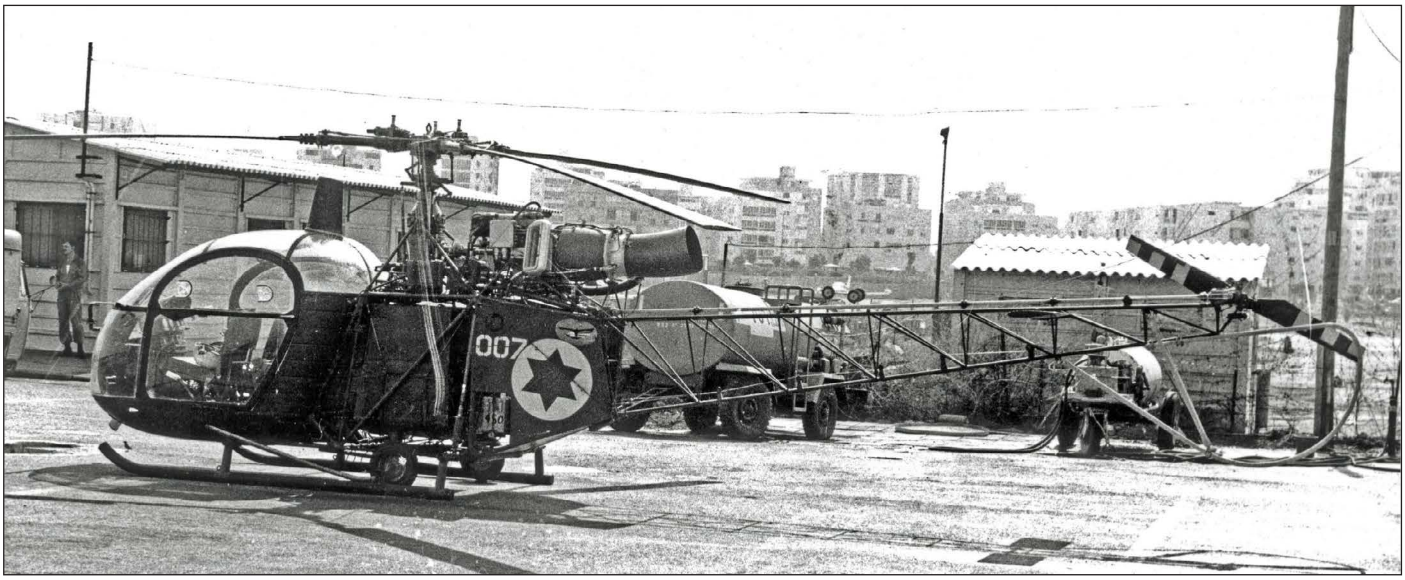
The Fokker S.11 was selected to replace the Stearman in the primary training role, the side-by-side seating being an attraction, although the decision was principally an economic one. The type proved a disappointment in many respects, though lackluster Israeli maintenance played a role. They were dropped from the primary training curriculum within six months and then sold off by 1956, some having never been uncrated. (BIAF – Israel Aerospace Magazine)



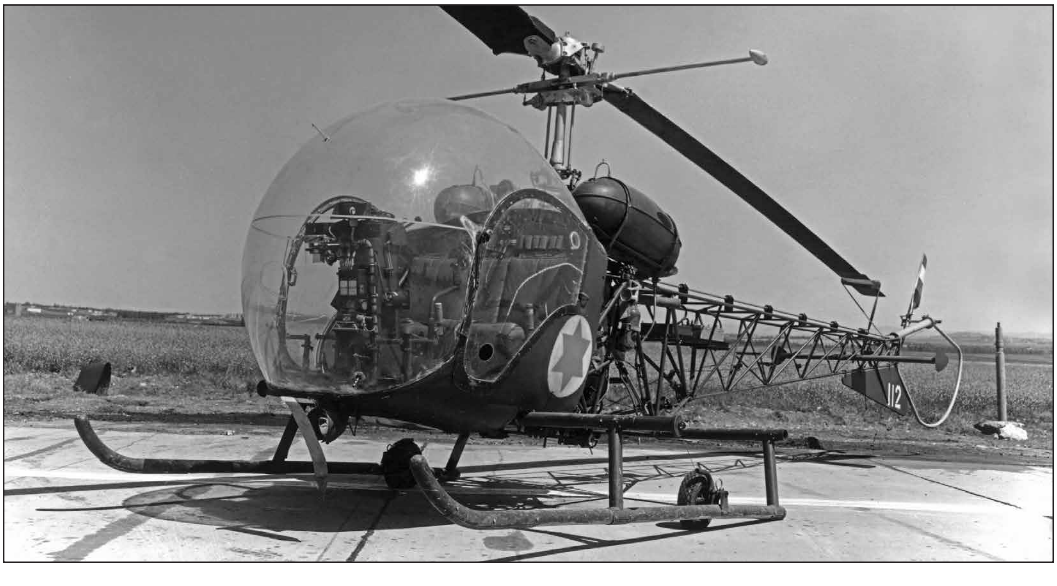
The Temco Buckaroo was also to be evaluated as a Stearman replacement. The S.11 was selected before the one Buckaroo was even in country. Nonetheless, it was evaluated and then used as a proficiency hack before being sold in 1954. (Ra'anan Weiss Collection)



The French were able to provide a jet trainer to replace all the vintage airplanes. It was also fitted out as a light attack airplane, though this was set aside after the Six-Day War experience. The Fouga Magister would continue in this role for nearly 50 years, the example shown wearing the markings of the aerobatic team and stained with display smoke residue. (Ra'anan Weiss Collection)



A turbine helicopter trainer was also acquired from France in the form of the Alouette II, replacing the piston-powered Bell 47. Like most aircraft in the IAF at the time, it served multiple roles besides training, and the Alouette performed liaison duties before and after its primary contribution as a trainer. This 125 Squadron machine is seen at Sde Dov in perhaps 1981 or 1982 when it was employed as an executive transport. (BIAF – Israel Aerospace Magazine)

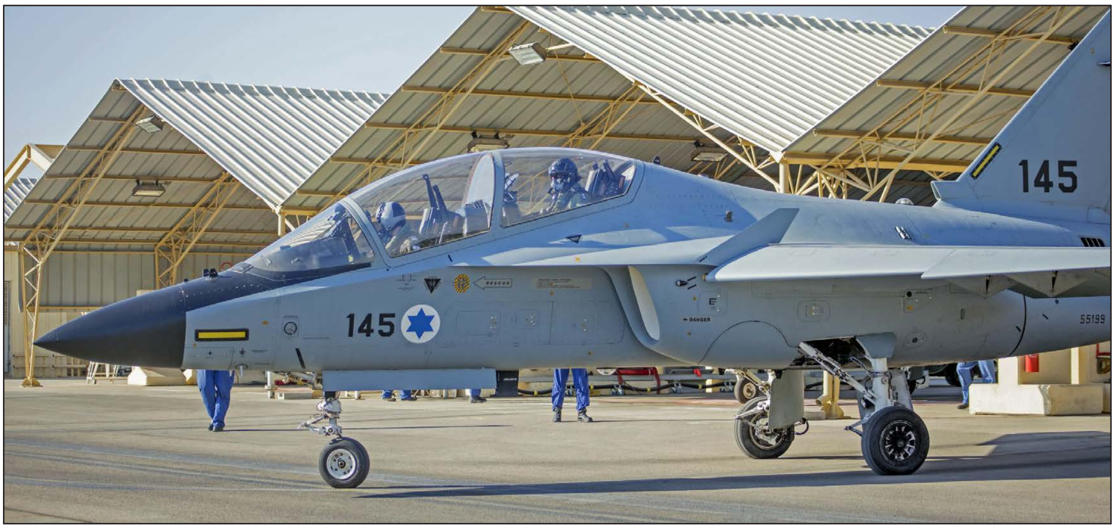


Israel's first dedicated rotorcraft trainer was the choice of many militaries around the world. The Bell 47s also performed the usual liaison and casevac missions. The 13 helicopters only served for a few years before being replaced by the jet-powered Alouette to meet the needs of the expanding turbine-equipped rotorcraft force. (BIAF – Israel Aerospace Magazine)

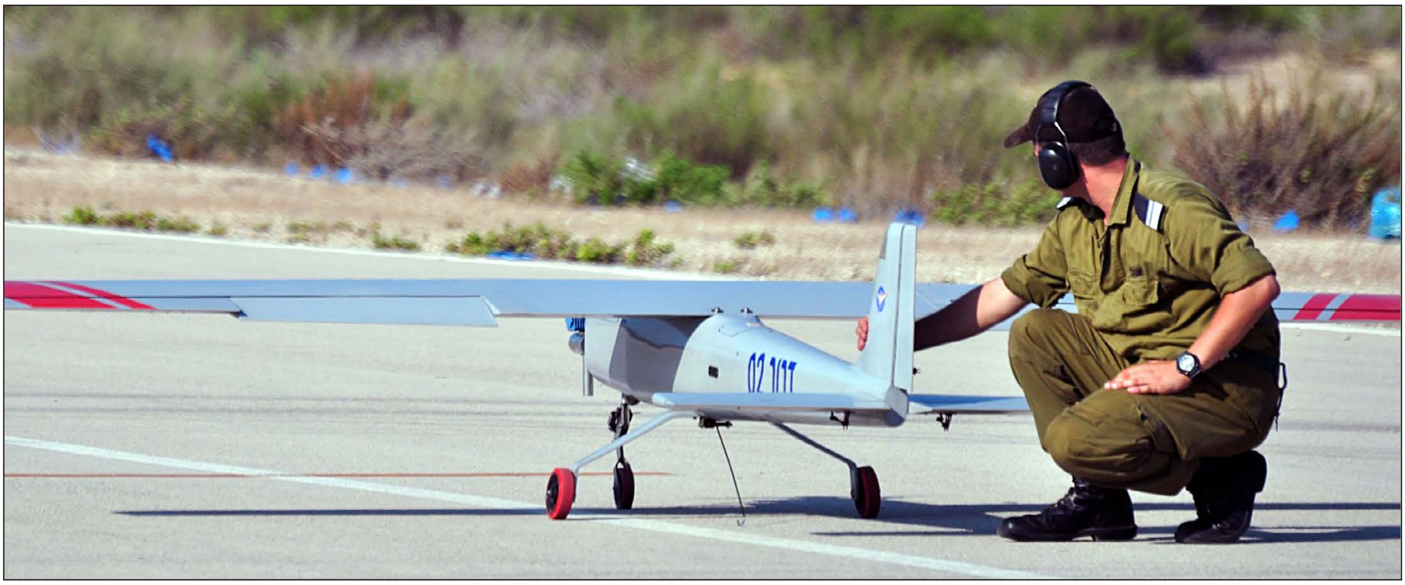
The Piper fleet was expanded in the 1950s with Super Cubs. These did the common liaison missions, but its principal role came to be flight training. The type was not retired until 2003, with more than 100 airplanes having passed through Israeli hands. (Ed Okun Collection)

The Cub was replaced in the cadet screening task beginning in 2002 by the Grob G 120. Marking the change in both equipment and size of the force, just 17 of the airplanes were acquired. They were maintained and operated under a commercial contract. (Israeli Air Force)

The elderly Magister was finally "put to pasture" in 2010. It was replaced in the basic flight training role with an economical turboprop in the Beechcraft T-6A. The fleet of 20 airplanes was maintained under contract but flown by IASF pilots. (Israeli Air Force)

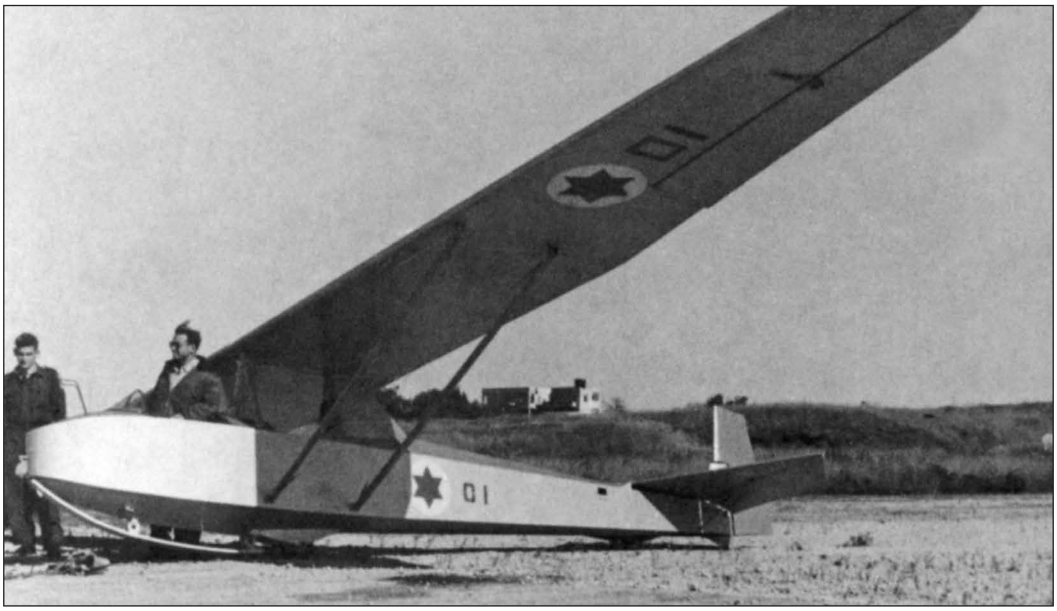


The replacement for the Magister in the advanced stage of instruction and for the A-4 in fighter transition training was long in being found. The IASF ultimately settled on an Italian product, the Alenia Aermacchi M-346. This provided a much more representative platform for those pilots bound to operate the modern combat aircraft in the inventory. (Israeli Air Force)



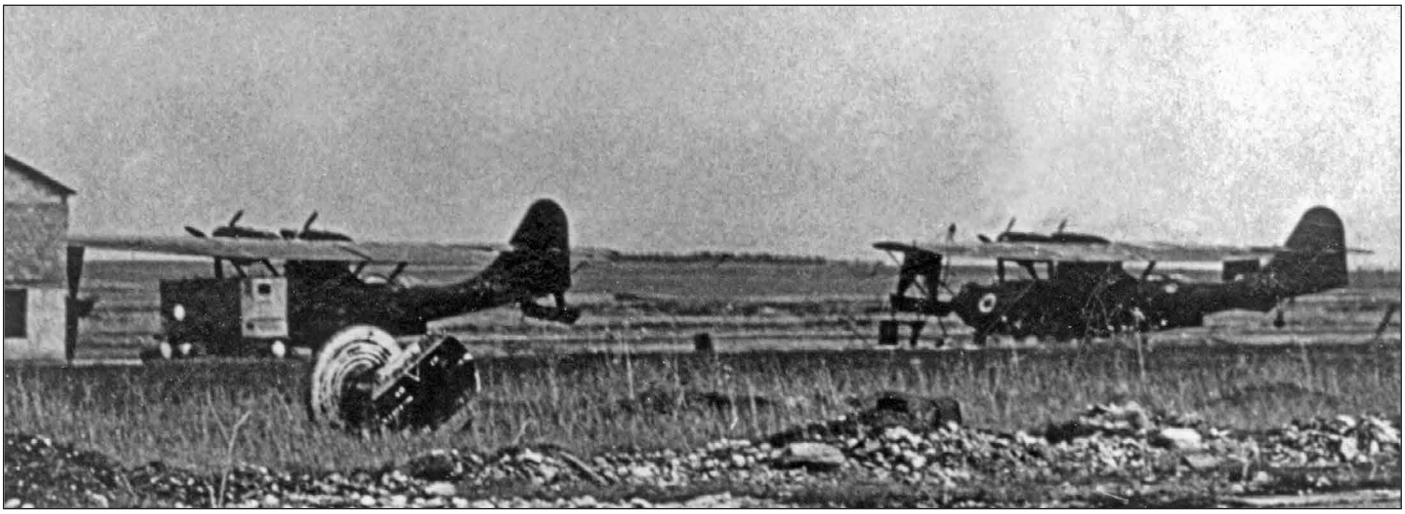
As the UAV force grew, flight training was conducted with RC models and then the earliest generation of operational systems. Eventually the simple Dror, shown here, was acquired for the role. Simulators were the principal training tool. (Israeli Air Force)

TRAINING (YOUTH)

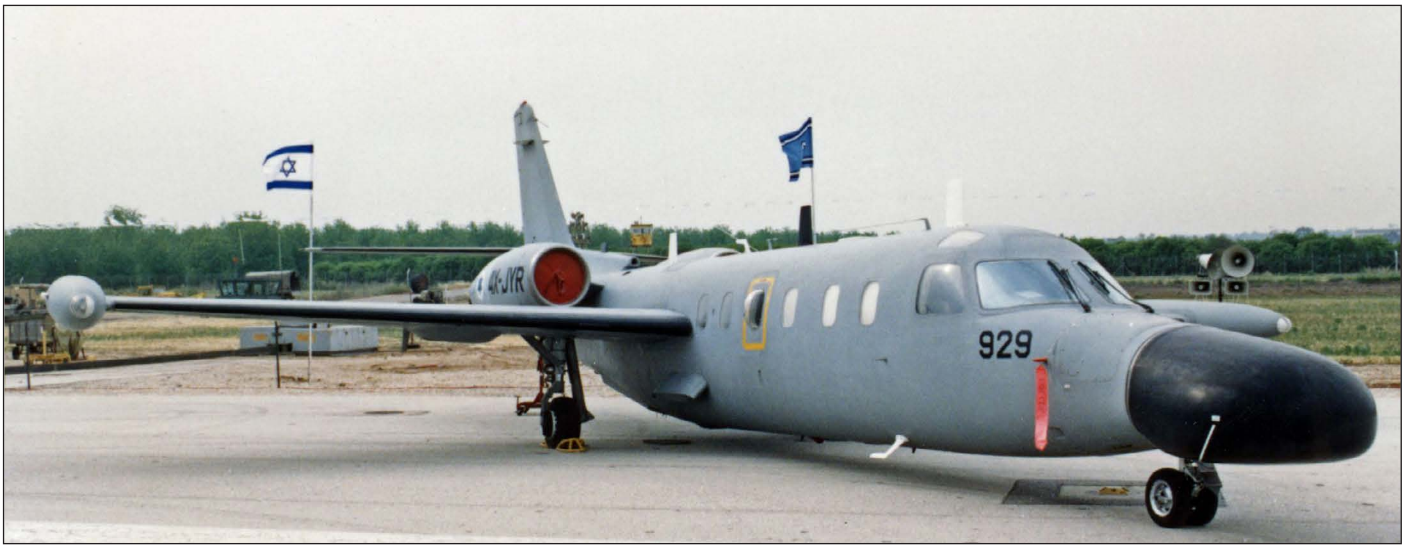


For youth flight introduction, Israel acquired various models of Slingsby gliders – shown here is a T.31B Tandem Tutor. While wearing military markings, they were commonly operated by local flying clubs under Air Force purview during the summer camps. The practice, at least under IAF supervision, ended in the 1960s. (Author's Collection)

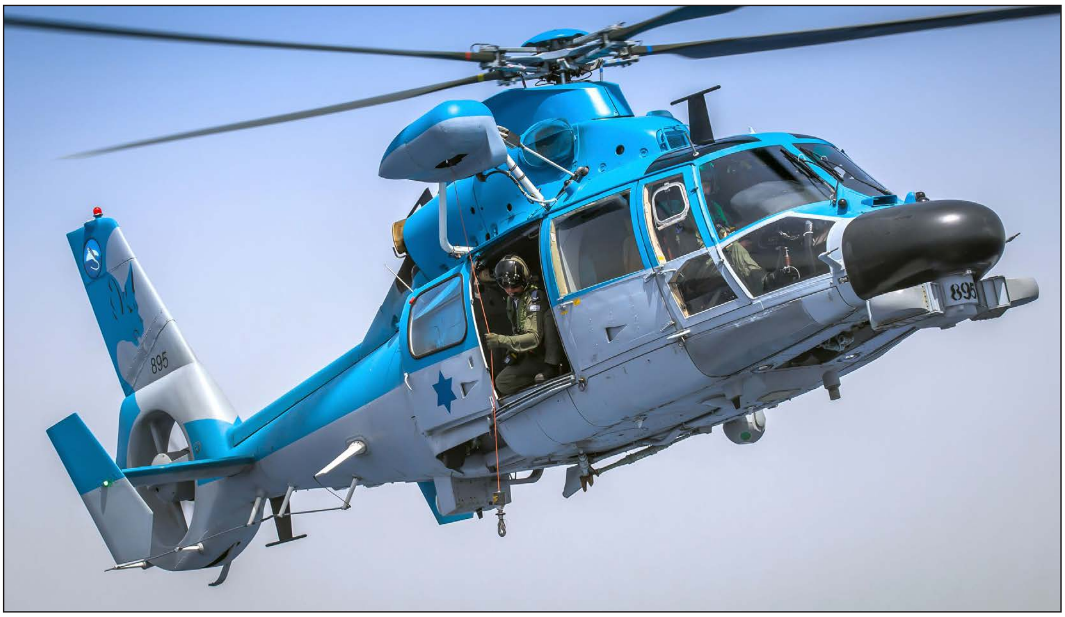
MARITIME



Three PBY-5 Catalina flying boats were procured in 1952 for maritime patrol and maintaining communications with Eilat should it be cut off by enemy action. Actual sea operations were kept to a minimum, but the aircraft became the property of the first Maritime Flight when this was stood up. The airplanes were difficult to maintain and operate, but they hung on until 1956. (BIAF – Israel Aerospace Magazine)

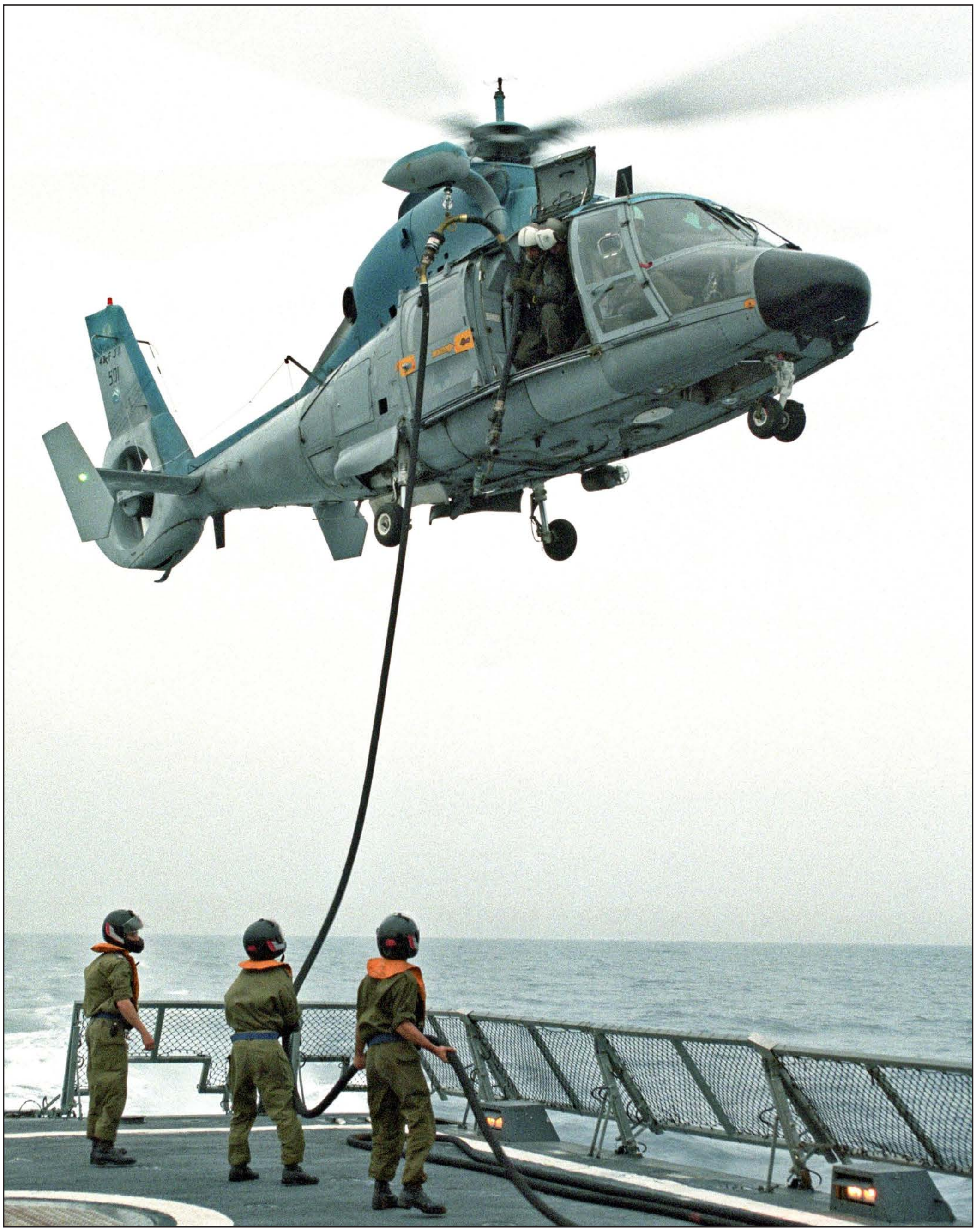


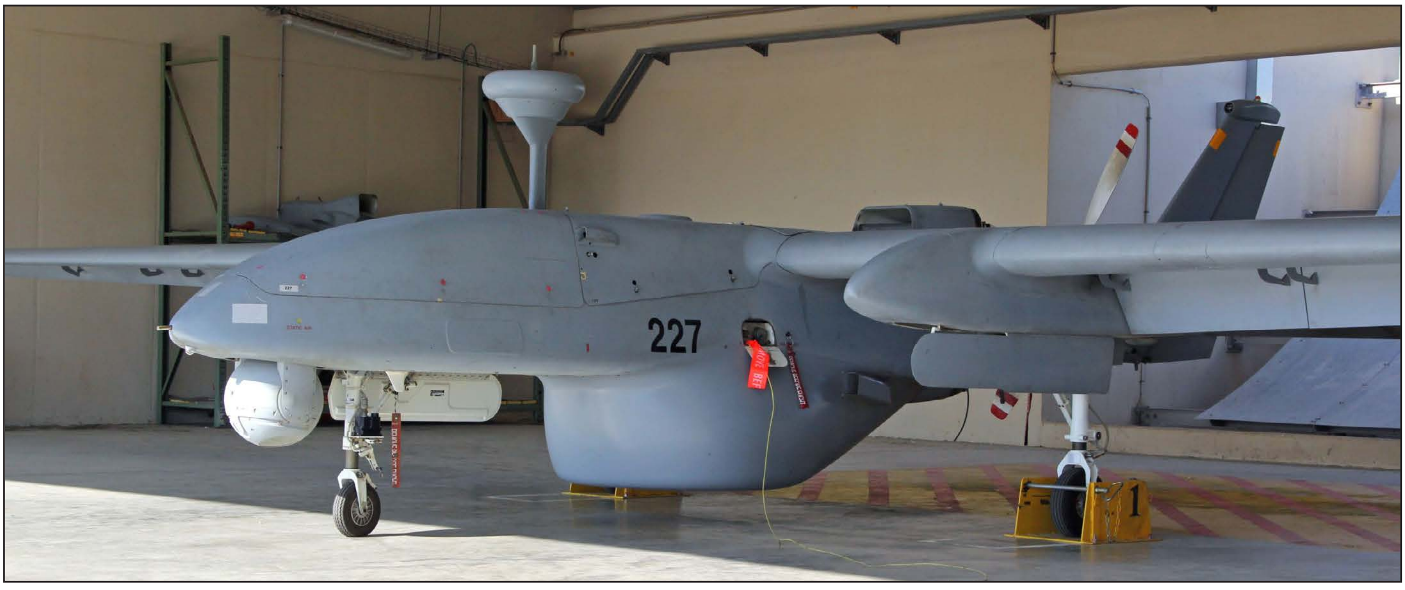
Ship- and shore-based radar combined with Air Force visual surveillance had served for coastal patrol since the mid-1960s. A terror attack on Tel Aviv from the sea in 1975 prompted resurrection of the Maritime Surveillance Flight to employ three Sea Scan aircraft from Israel Aircraft Industries, providing around-the-clock airborne radar monitoring. These were modified Westwind aircraft that served from 1978 to 2017. (Author's Collection)



After much delay, rotorcraft meeting the Navy's shipboard needs came in 1996 via five Aérospatiale Panthers, still operated by the Air Force. These had the sensors and avionics long desired for over-the-horizon targeting and ocean surveillance. With the Navy acquiring corvettes with helo decks, the decade-long program was fulfilled. (Nir Ben-Yosef Collection)

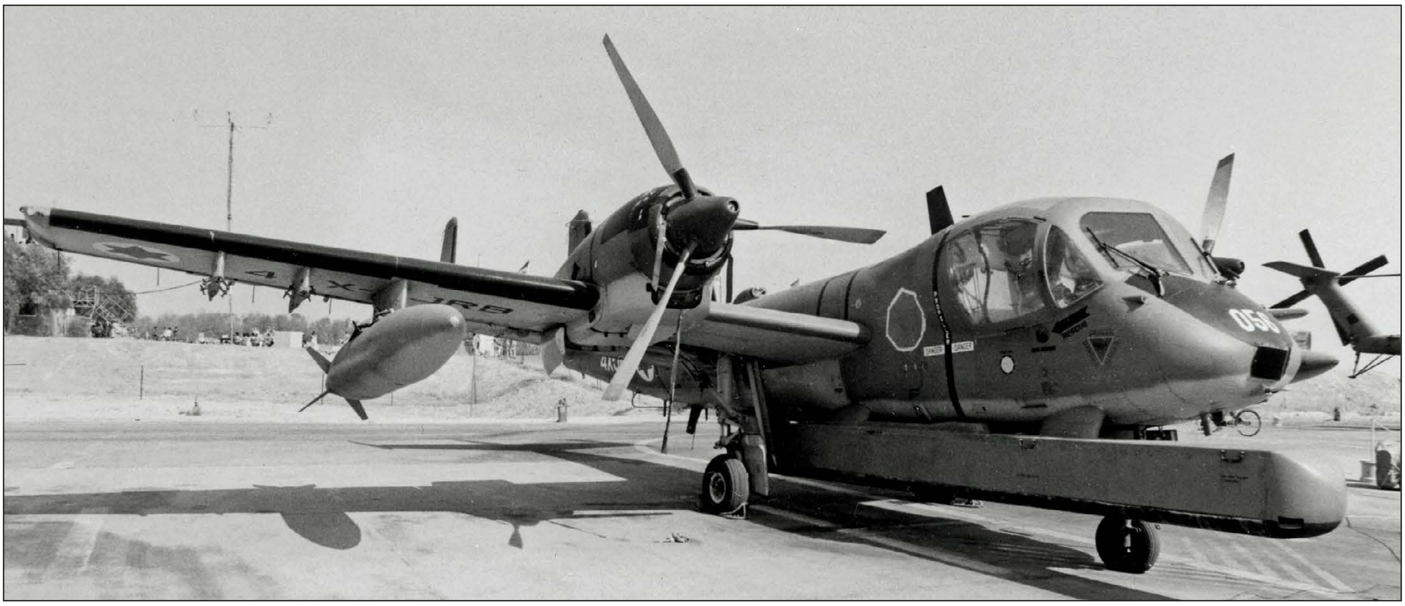
The Israeli Navy began placing helicopter decks on its vessels in the 1960s to conduct trials and began acquiring fast missile boats with decks in the 1980s. It was 1985 before they acquired two used Aérospatiale HH-65A Dauphins to gain shipboard helicopter experience. Operated by the IAF on behalf of the Navy, these were not fully equipped for the mission and were replaced in 1997 when funds allowed. (Ofer Zidon Collection)



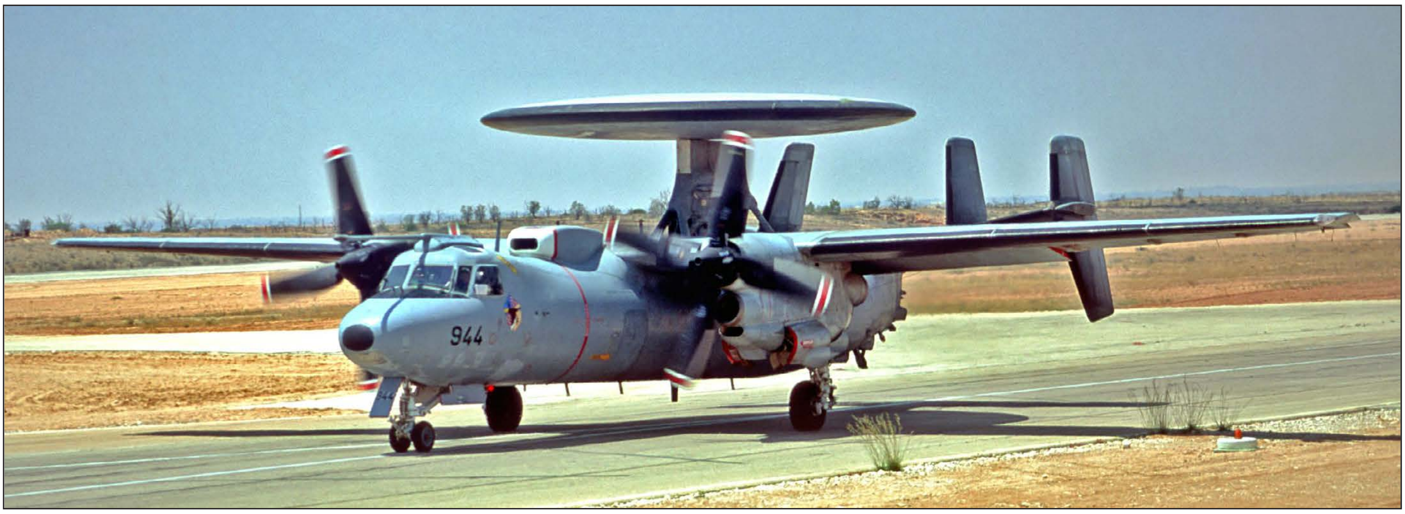


The Sea Scans were replaced in 2017 with UAVs, as long expected. The Heron I. was derived from an Air Force UAV, but with a naval radar added. These could maintain the 24-hour surveillance at lower cost. (Ofer Zidon Collection)

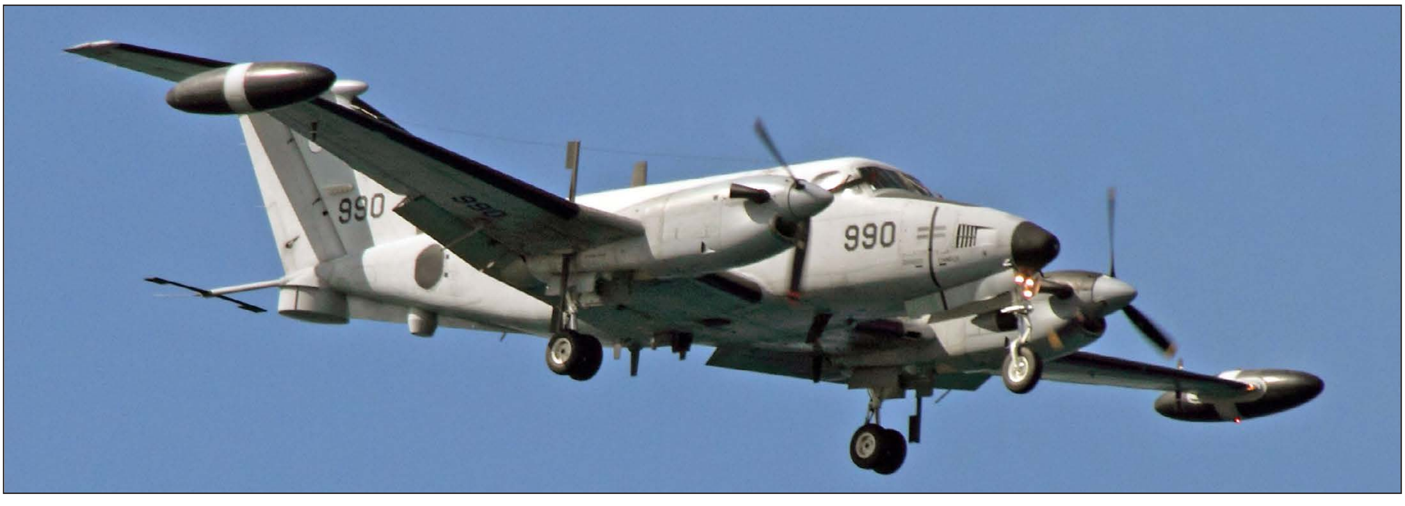
ELECTRONIC WARFARE (PRINCIPAL USE)



The Yom Kippur War demonstrated that the electronic warfare mission could no longer be effectively fulfilled as ancillary tasks of other aircraft. The US sent two Grumman OV-1D aircraft in 1974, possessing assets permitting the monitoring of enemy troop dispositions from across the border. Their presence in Israel was kept secret until after they had been set aside. (Ron Feldman Collection)



Another resource acquired following the Yom Kippur War was airborne early warning via four Grumman E-2Cs. These helped in orchestrating air battles, such as that over Lebanon in June 1982. Their operations ceased in 1994 as a budget cutting measure, though their effectiveness was also questioned. (Ofer Zidon Collection)



The Beechcraft RC-12s were a cost-effective airborne electronic warfare platform that attracted IAF investment. Five RC-12D aircraft were taken up in 1985 and two Ks (one shown) in 1991. These had their internal EW suite altered as required over the years. (Ofer Zidon Collection)

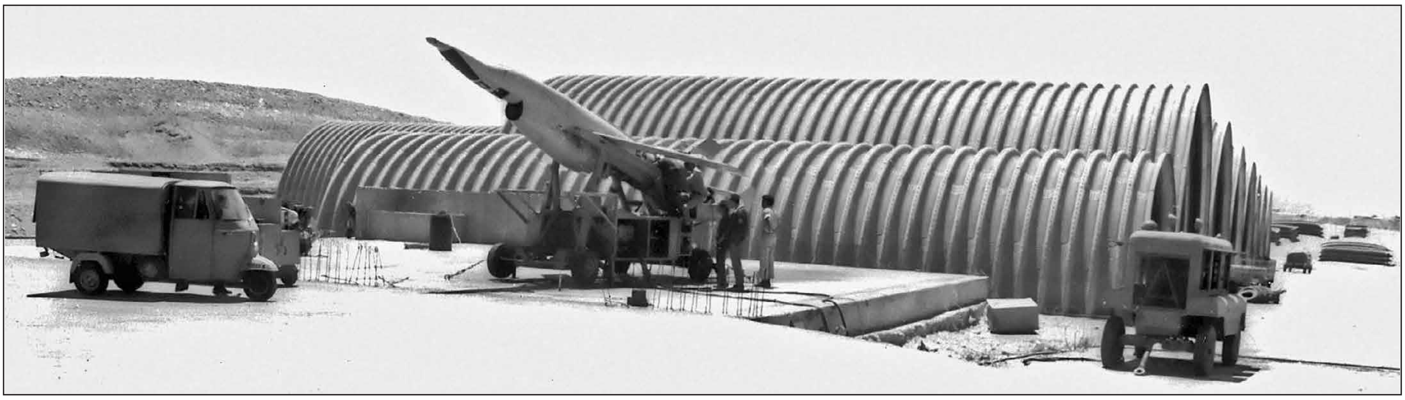
Moving electronic warfare resources from aboard Boeing 707s to more reliable and less costly platforms saw Gulfstream business aircraft adapted. Three of the G.V “Shavits” were fielded from 2005 with 122 Squadron. These were said to cover the signals intelligence mission, but much more was possible that remained unsaid behind a veil of classification. (Ofer Zidon Collection)

The airborne early warning capability was resurrected in 2006 when two G-550 “Eitams” were introduced, a third added later. The equipment was largely Israeli, installed in-country. As with earlier IASF aircraft, these airplanes could be expected to remain on force for decades. Aircraft 569 of 122 Squadron was photographed in 2019. (Israeli Air Force)

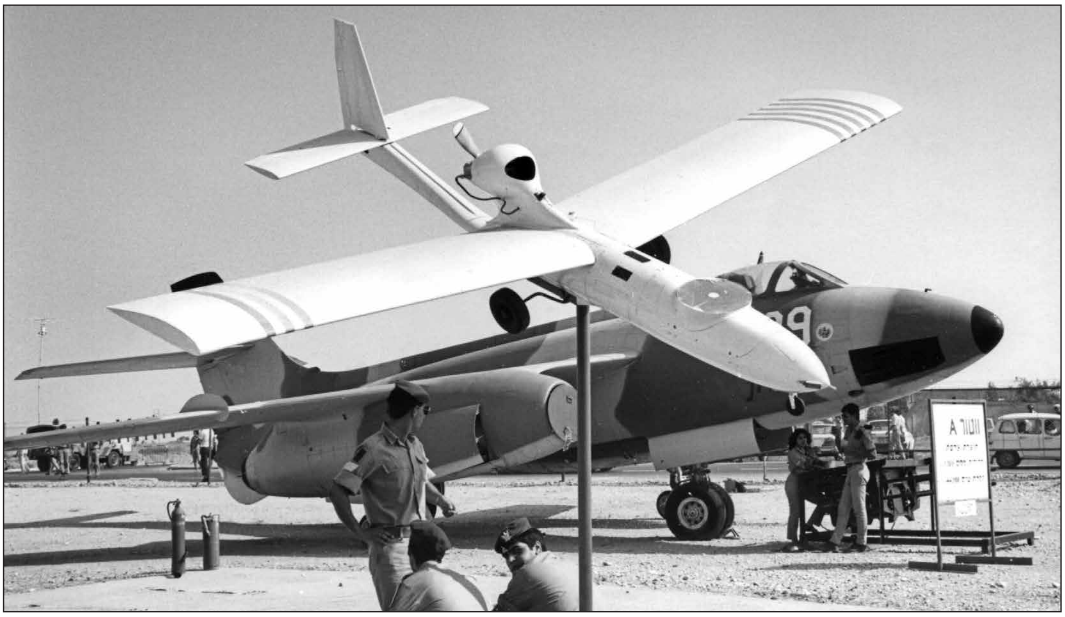
FIREBOMBER

When Israel was compelled by severe wildfires to purchase firebombing aircraft, she looked to the Air Force to operate them. In this way the service came to operate seven Air Tractor Firebosses in 2011. However, it was decided to let civilian operators handle the mission and the airplanes left the force after a short time. (Ofer Zidon Collection)

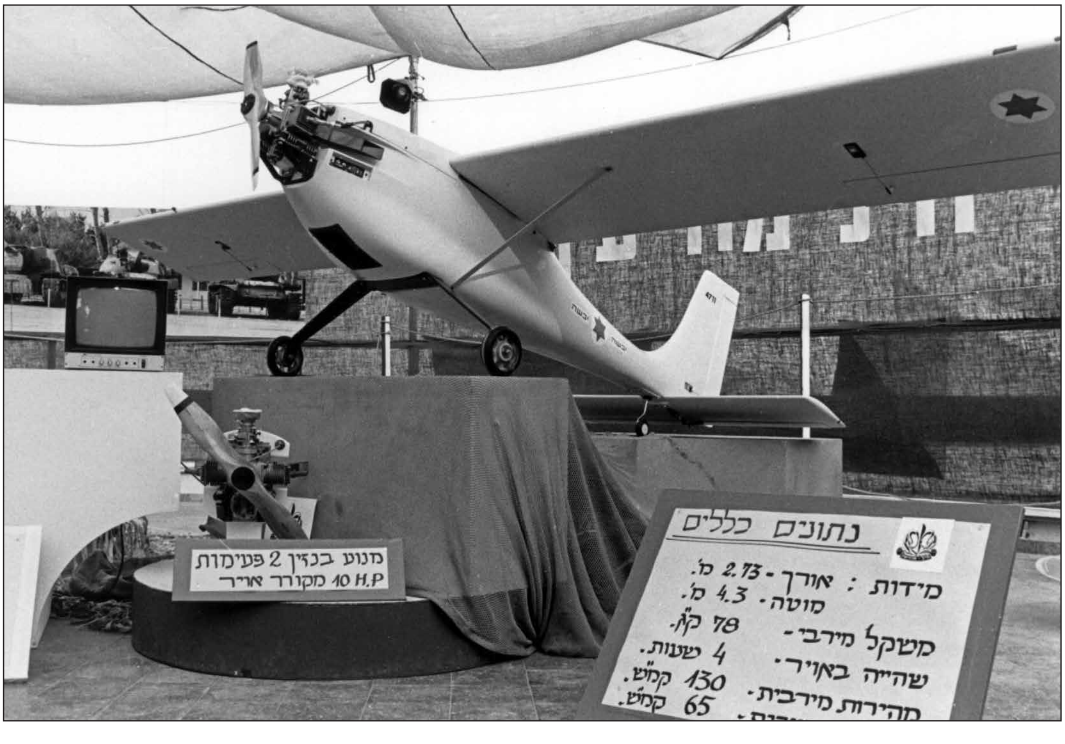
SURVEILLANCE – UNMANNED AIRCRAFT



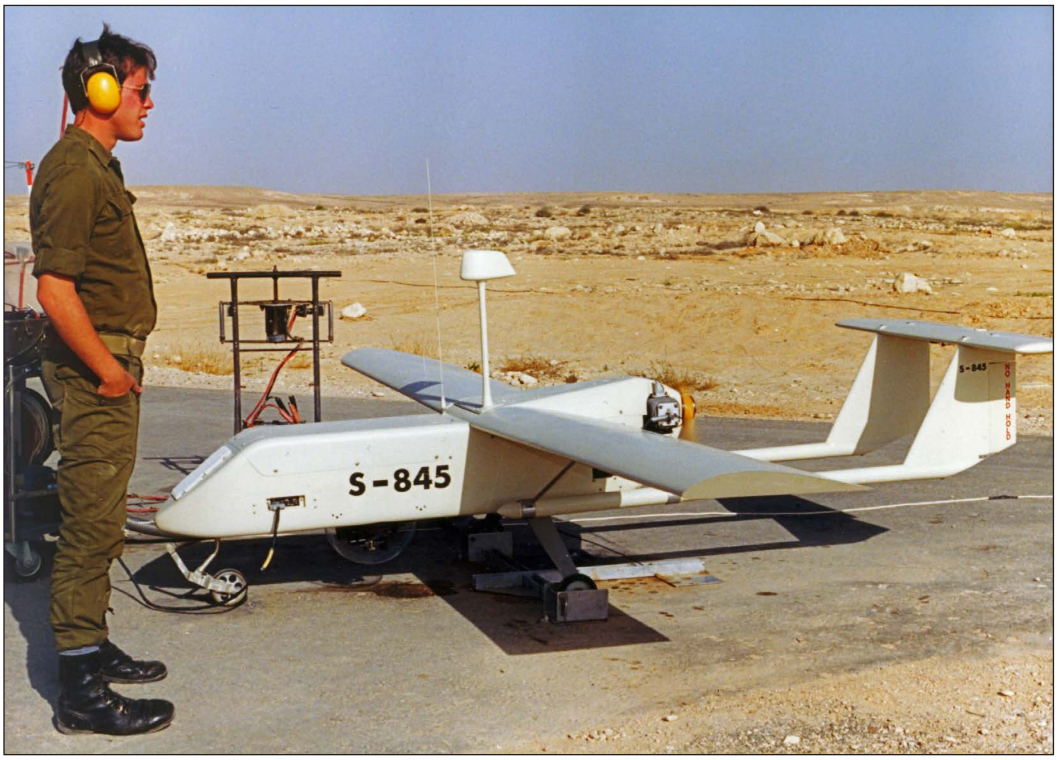
Following the War of Attrition, Israel contracted with Ryan to adapt the Firebee reconnaissance drone to their needs. The 124I was important for penetrating air defenses to collect intelligence rather than risk manned aircraft. This shot from the Yom Kippur War shows one of the drones being made ready for launch at Refidim AB. (Ra'anan Weiss Collection)



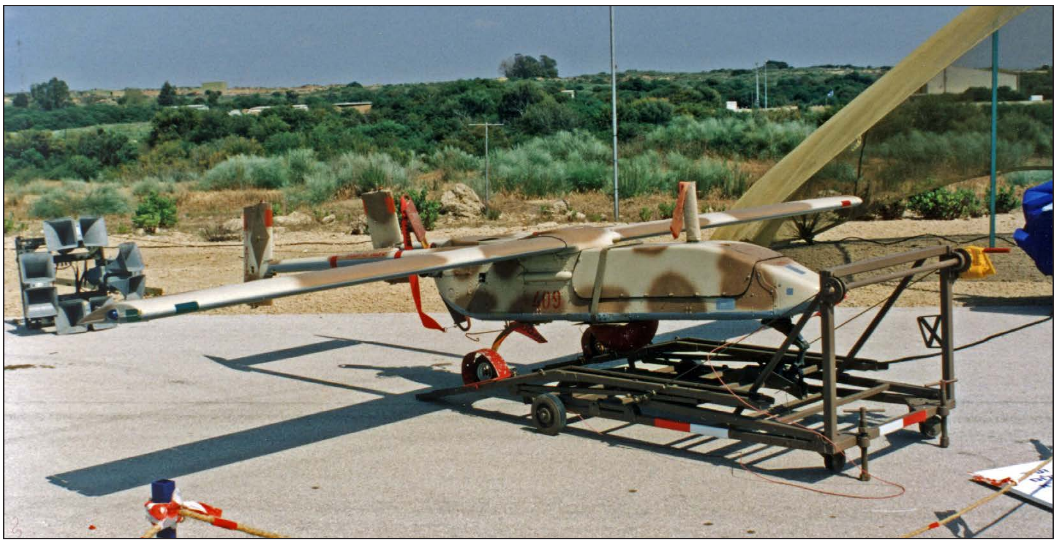
Apart from experiments with RC airplanes equipped with still cameras, Israel acquired two developmental mini-PRV systems from Ford in 1977 to gain experience and avoid pitfalls in their own programs. The Prairie IIB was equipped with a video camera and laser designator. It was evaluated and used in operational missions over Lebanon. (BIAF – Israel Aerospace Magazine)


נתונים כללים
מידות : אורך - 2.73 מ'.
מוטה - 4.3 מ'.
משקל מירבי - 78 ק"ג.
שהייה באויר - 4 שעות.
מהירות מירבית - 130 קמ"ש.
65 קמ"ש.
מנוע בנזין 2 פעימות
מקורר אויר 10 H.P

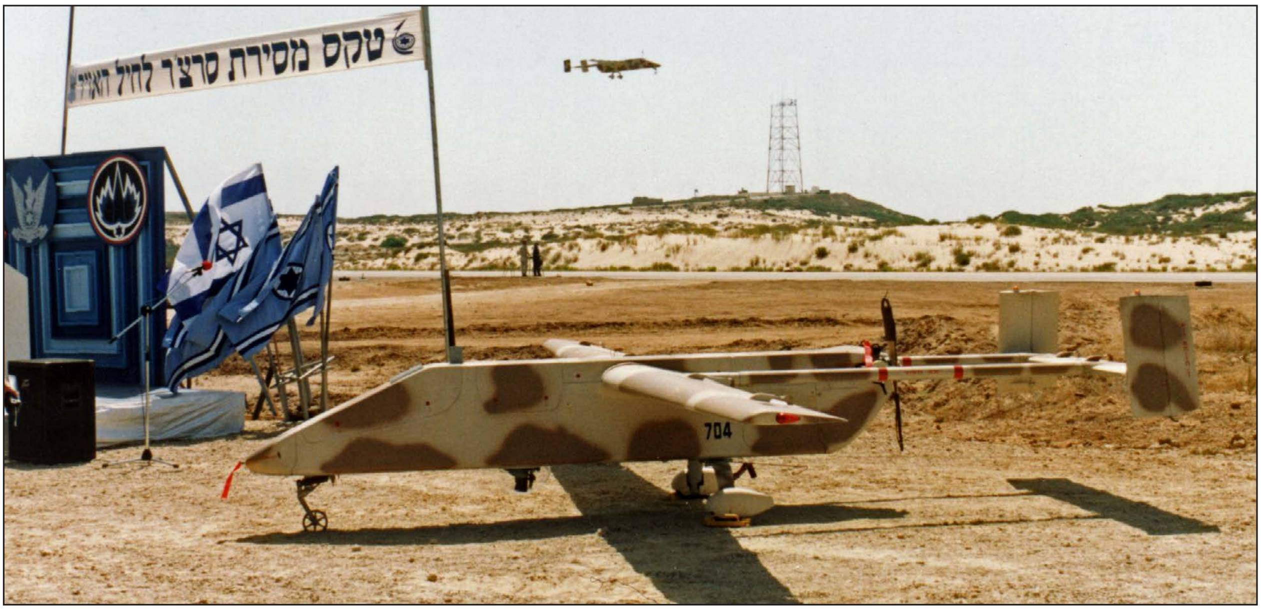
Tadiran Electronics Industries produced the first Israeli min-RPV in the Mastiff. This had a 14-hp gas engine, a 33-lb payload that included a television camera and could be operated manually or autonomously. Only two systems were sold, these probably to the IDF for evaluation. (BIAF – Israel Aerospace Magazine)



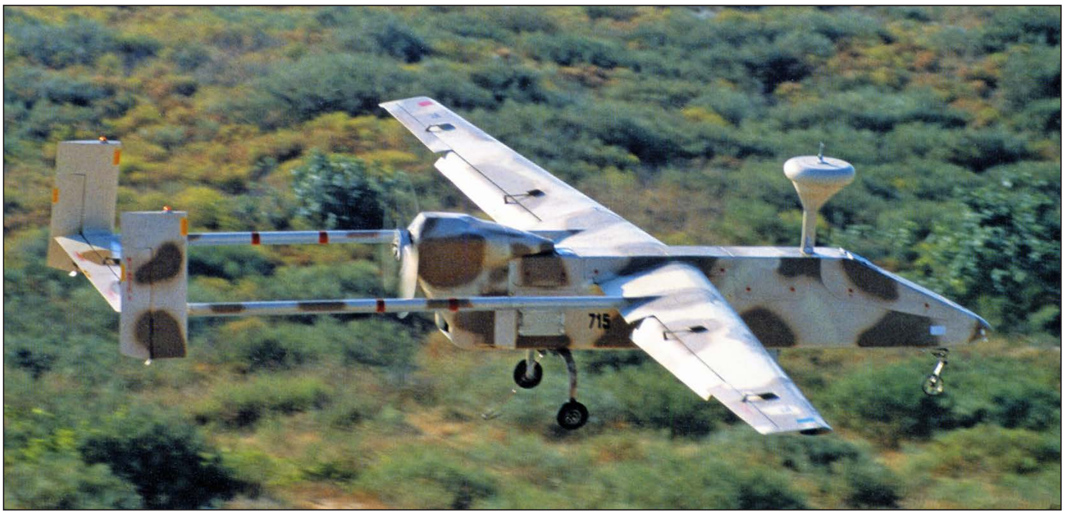
The Mastiff design progressed to the Mastiff III that was a mature, fieldable system. It had many features of current UAV systems with a mix of optional payloads. The Mastiff was still under evaluation when employed operationally during the 1982 Lebanon campaign and then operated by military intelligence into the early 1990s. (BIAF – Israel Aerospace Magazine)



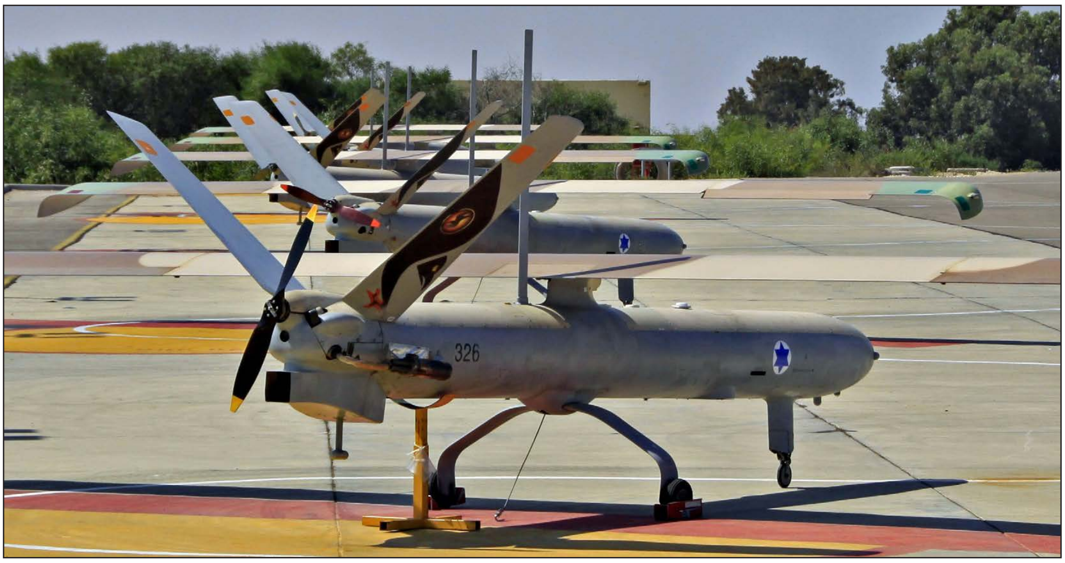
Competing with the Mastiff was the Israel Aircraft Industries Scout with similar features and capabilities. It, also, was operated in Lebanon during 1982 while under evaluation and was seen as successful and valuable. The IAF adopted the system as its standard mini-RPV through the early 1990s. (Yoav Efrati Collection)



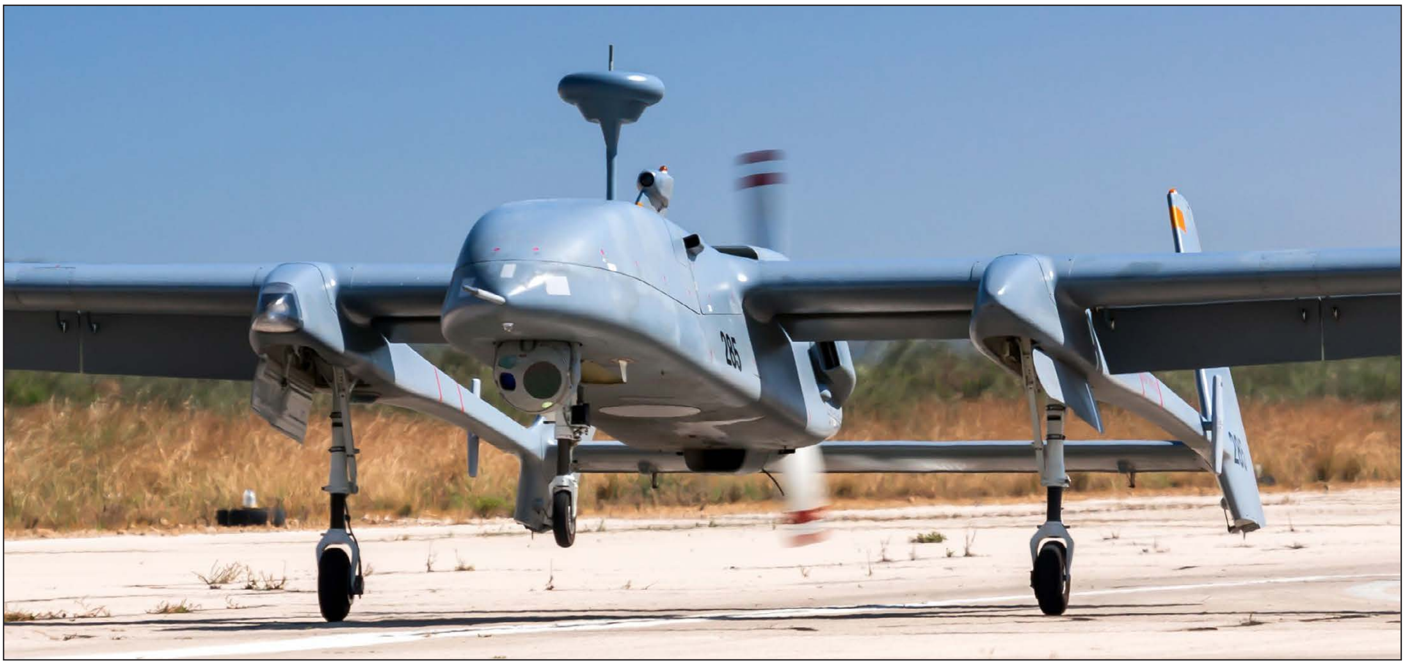
A clear development of the Scout, the IAI Searcher became the standard mini-RPV system for the IAF and Intelligence Corps in the early 1990s. As with each new generation of these systems, power, payload, range, and cost all took a step up. More than a hundred of the aircraft were likely produced for IDF use. (BIAF – Israel Aerospace Magazine)



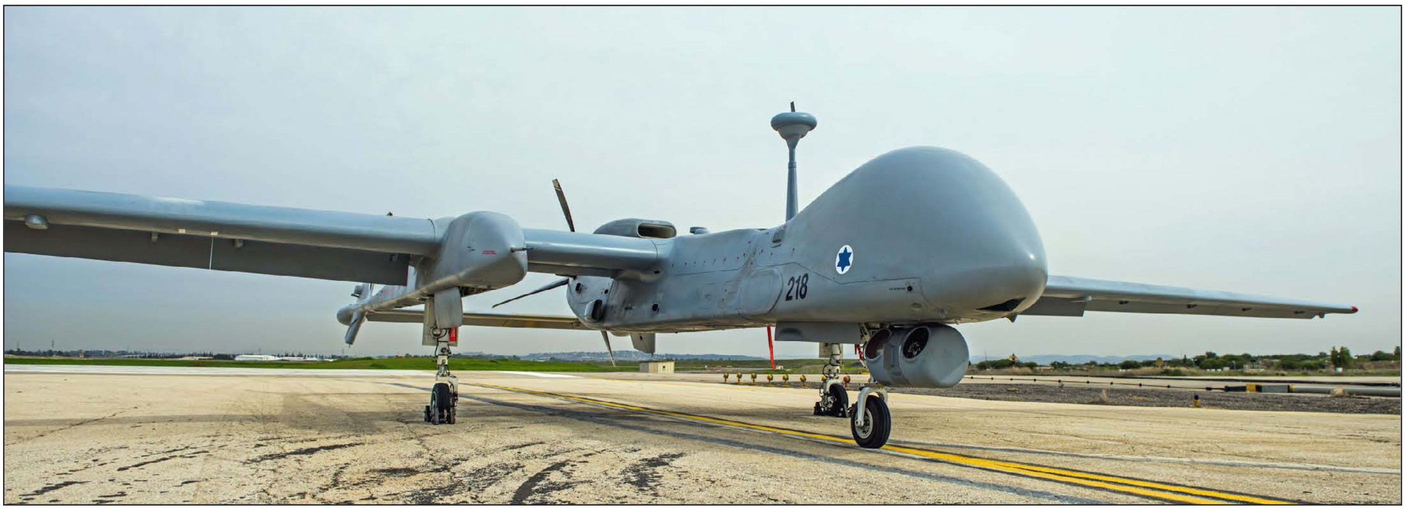
The Searcher II continued the system growth. By this point such UAVs were supporting nearly every IDF operation as an integral element. Even as far more capable systems were adopted, the Searcher II continued as a low-end element until about 2000. (IDF Spokesman)



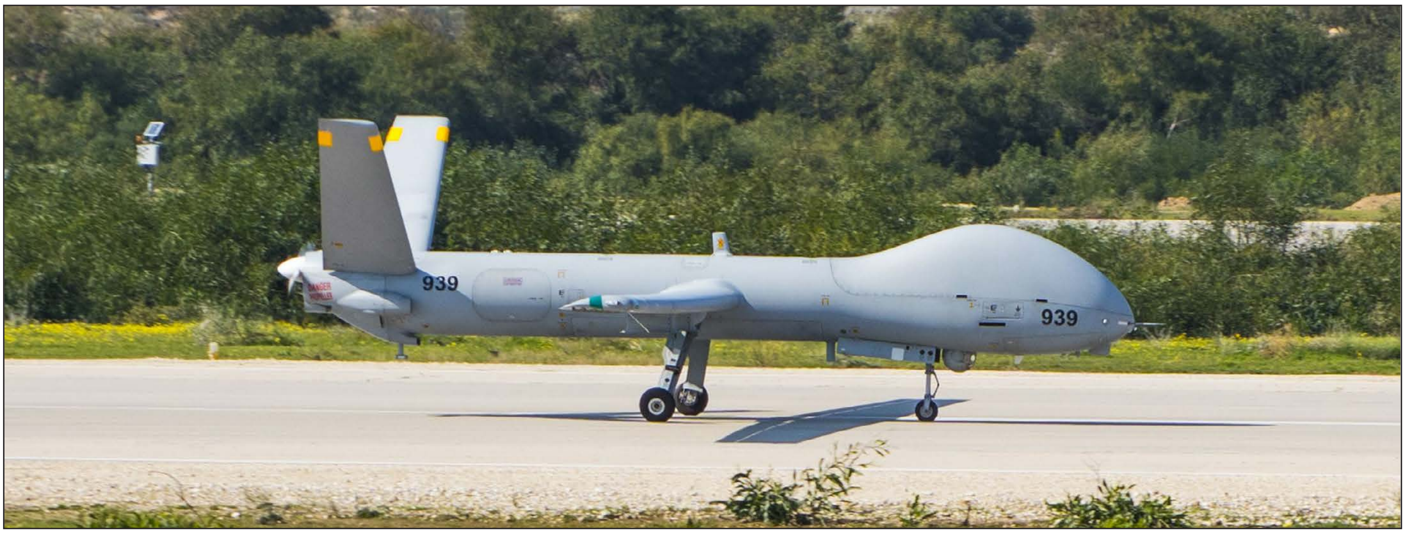
The need for a high-altitude/long-endurance UAV yielded the Silver Arrow Hermes 450S. Tested in 2002 during which it was employed operationally, it had most features of current UAVs to include optional armament. It, also, eventually became the low-end system and continued operating to date of writing, these airplanes with 166 Squadron markings and rare national roundel. (Ofer Zidon Collection)



The next generation of UAVs featured retractable undercarriage and wheel brakes to dispense with the arrestment recovery. The IAI Heron was introduced in 2007 with 500-lb payload and was fully autonomous from takeoff to landing. Its high altitude and long endurance performance added greatly desired mission capabilities. (Nir Ben-Yosef Collection)

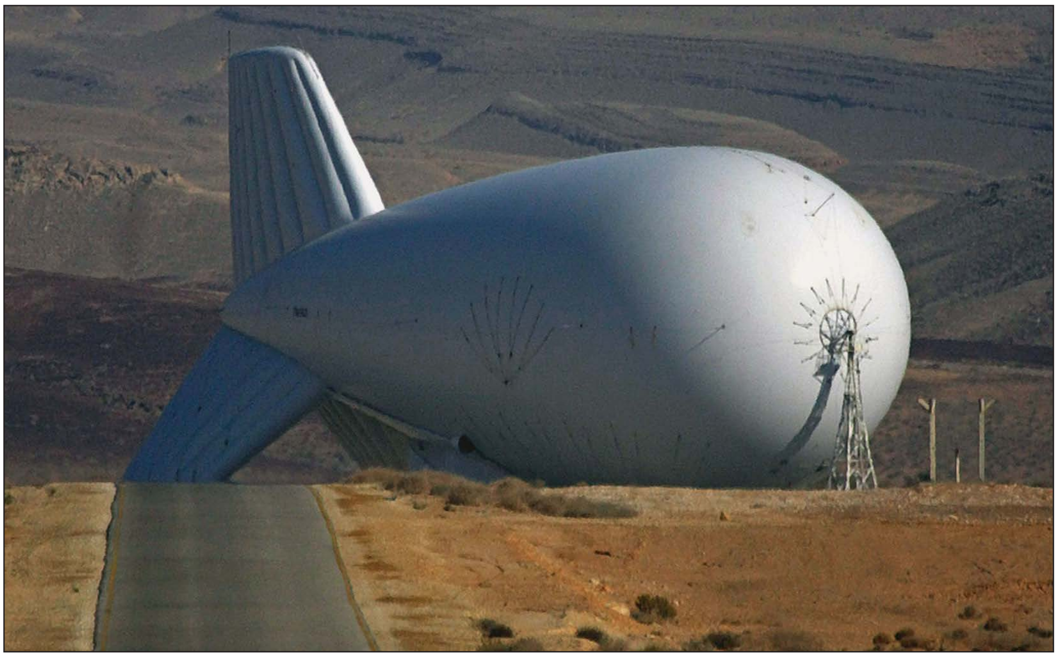


The Heron TP 'Eitan' was the largest Israeli UAV at 85 feet span and turboprop powered. Its performance answered the need to surveil such distant objectives as Iran. Its operations were integrated with manned flights to a degree not previously attempted. (Israeli Air Force)



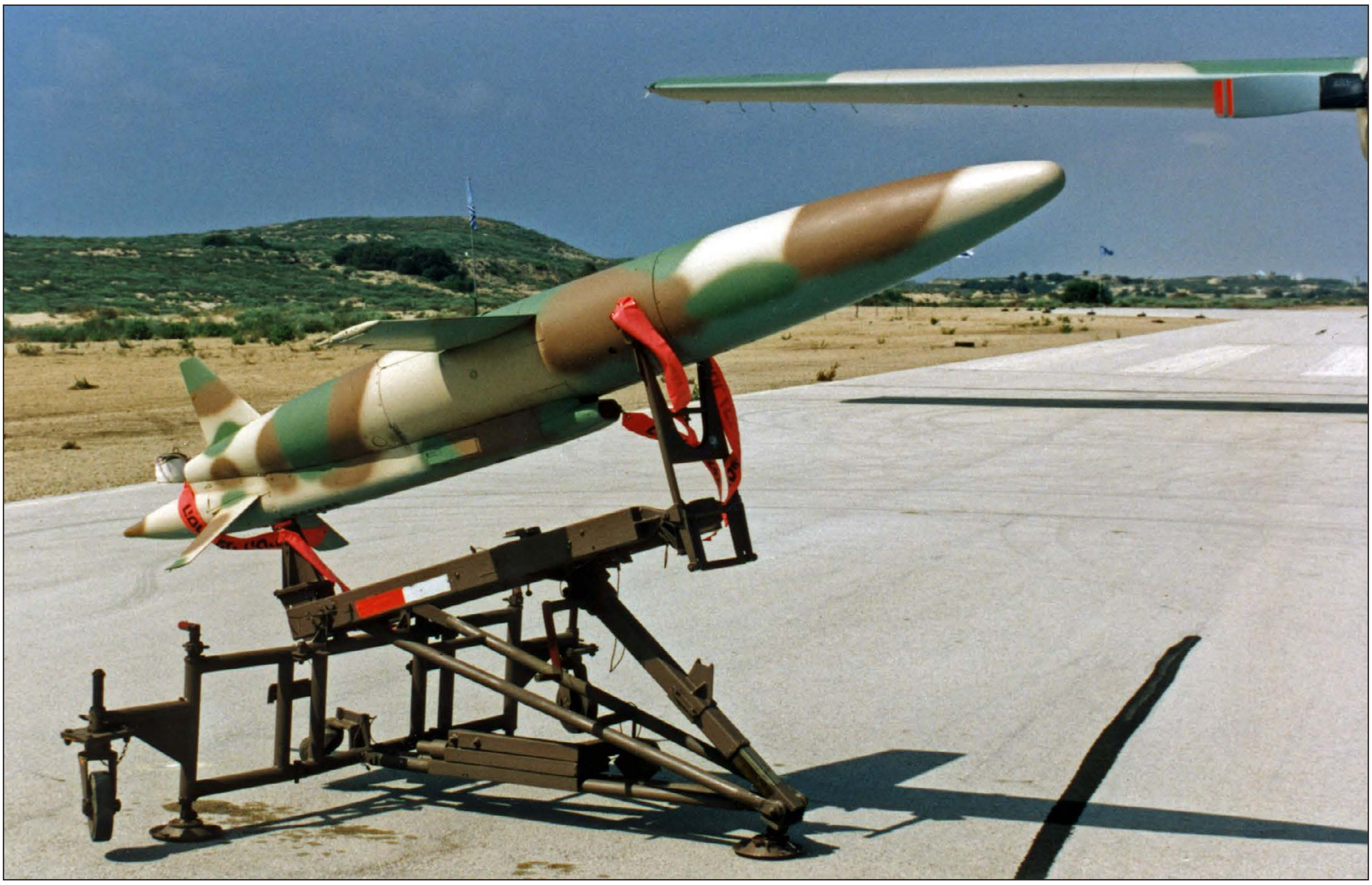
Updating the medium-size UAVs saw the Elbit Hermes 900 added in 2015. It brought satellite communications to permit more distant operations. Like the Hermes 450S, this aircraft was like optionally armed with guided air-to-surface missiles. (Israeli Air Force)

SURVEILLANCE – UNMANNED AEROSTAT

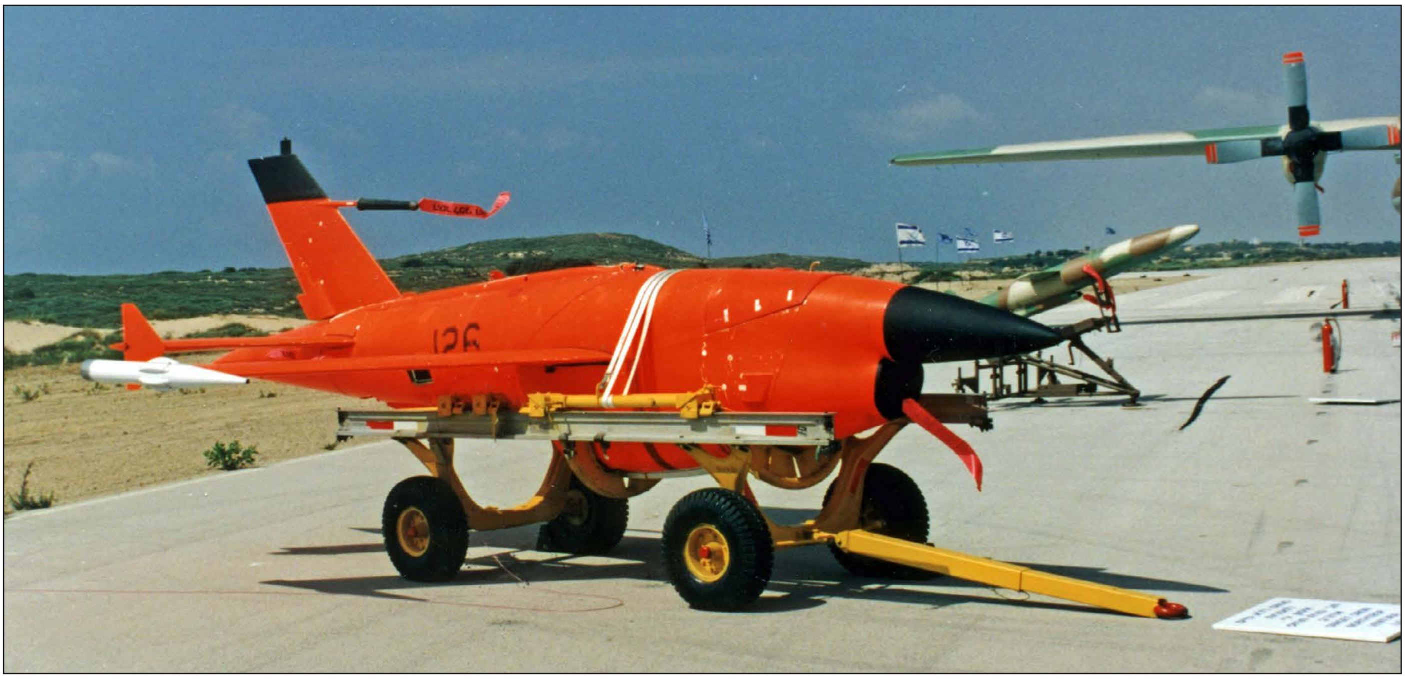


Israel had operated a number of tethered observation balloon systems over the years. This 71M by TCOM has been drawn down to the mast, likely near the southern border. The photographer has ensured that the bottom sensor package is obscured by the terrain. (Israeli Air Force)

DECOY/TARGET (UNMANNED)

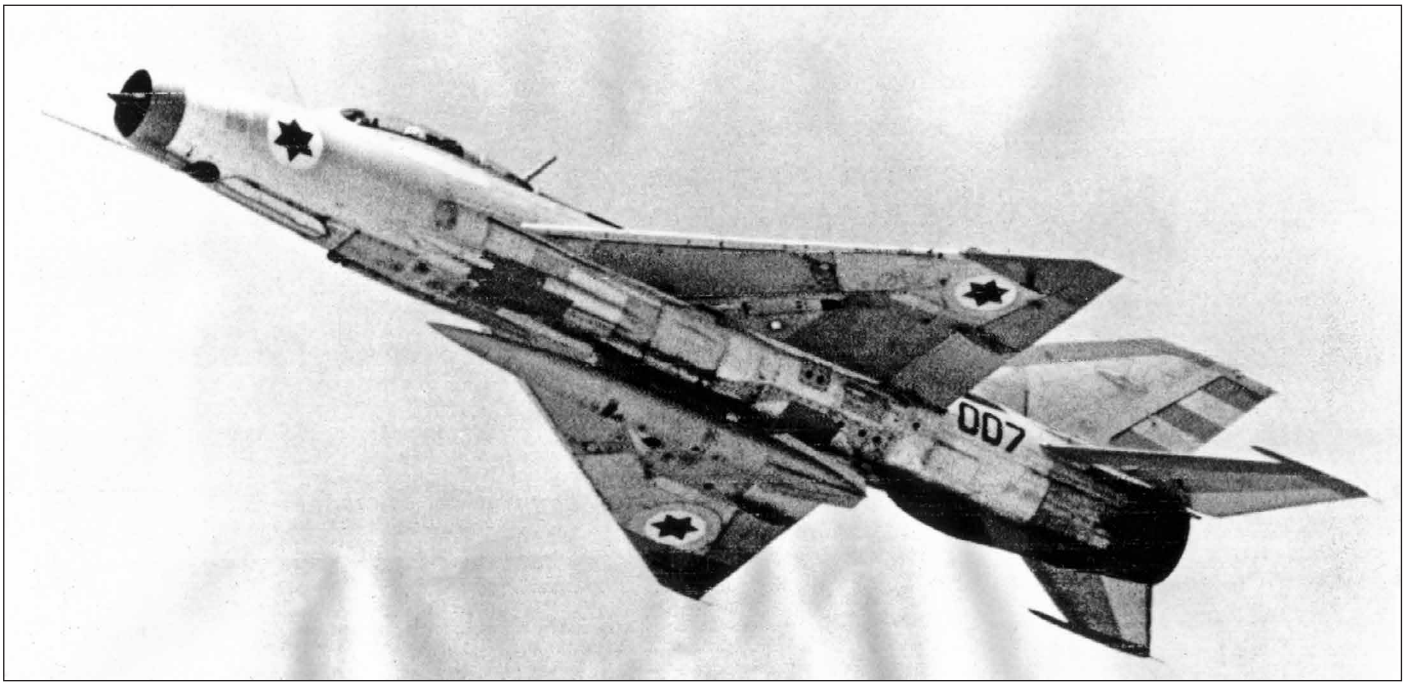


The Northrop Chukar air-launched decoy was adapted for ground launch at Israeli request. These were employed in the Yom Kippur War, but with poor coordination. Small cameras were also fitted to them to serve as reconnaissance assets. (Yoav Efrati Collection)

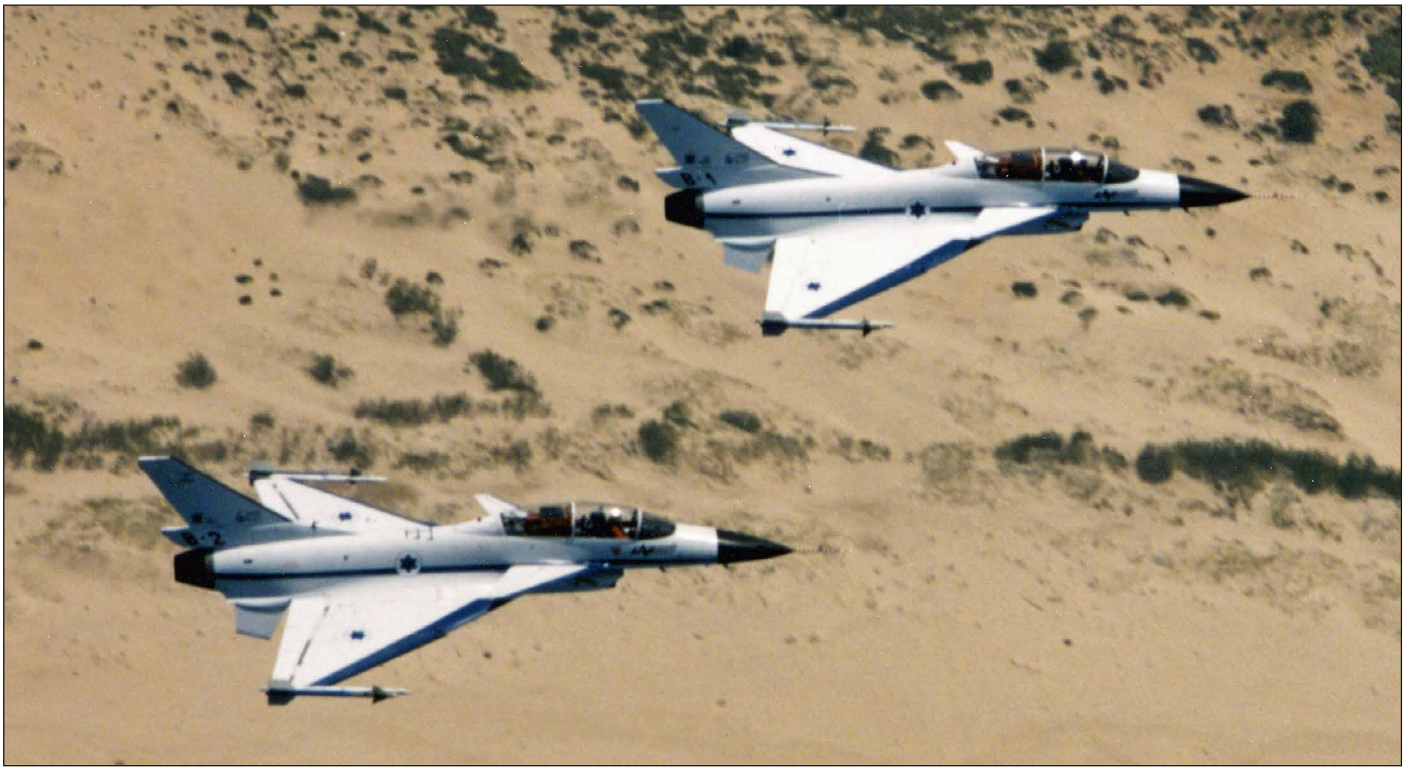


Additional Firebee drones were acquired in the 1970s and possibly 1980s to serve as targets. These were either for local air defense system training or to cause enemy air defenses to become active and assist in targeting them. These assets left the inventory in 1995. (Yoav Efrati Collection)

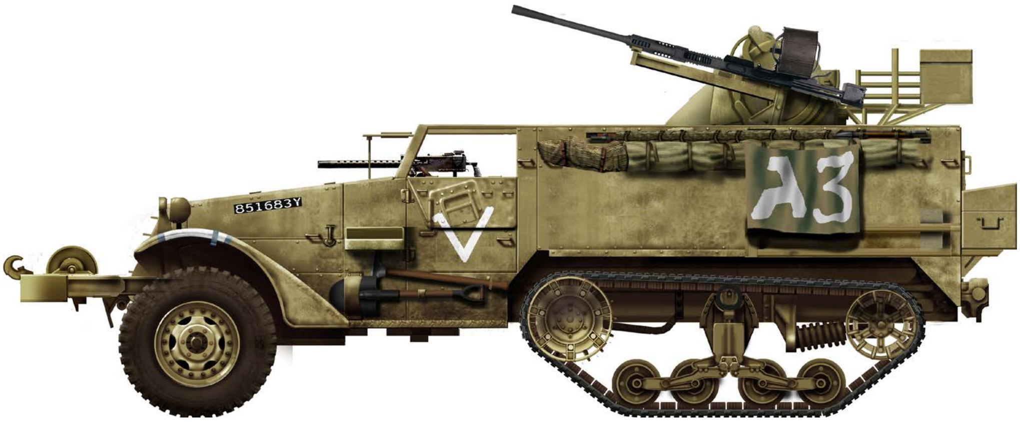
OTHER



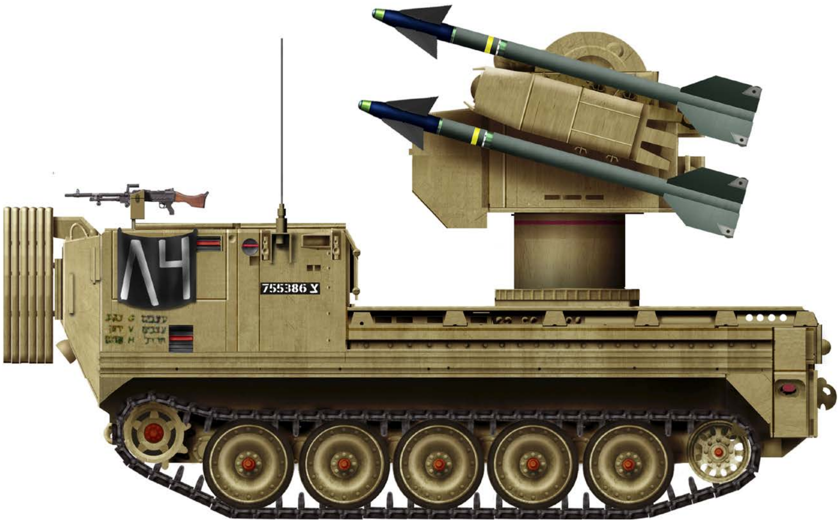
Israel captured and evaluated several opposition aircraft over the decades. However, its MiG-21, obtained via encouraged defection of an Iraqi pilot, was placed into emergency service during the Six-Day War. Armed with Shafrir 2 missiles, it sat alert to intercept any inbound enemy reconnaissance aircraft. None came its way. (Author's Collection)



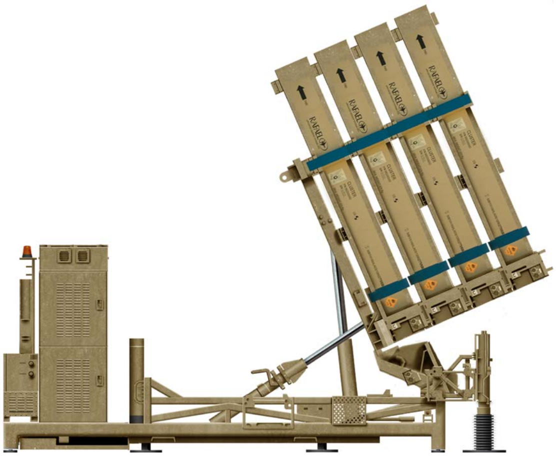
Israel sought to sustain its combat aircraft manufacturing capability with the Israel Aircraft Industries Lavi fighter-bomber developed with considerable IAF input. This got as far as flight test in 1987 but was proving too costly. Three machines were completed, all two-seat B models. (Ron Feldman Collection)



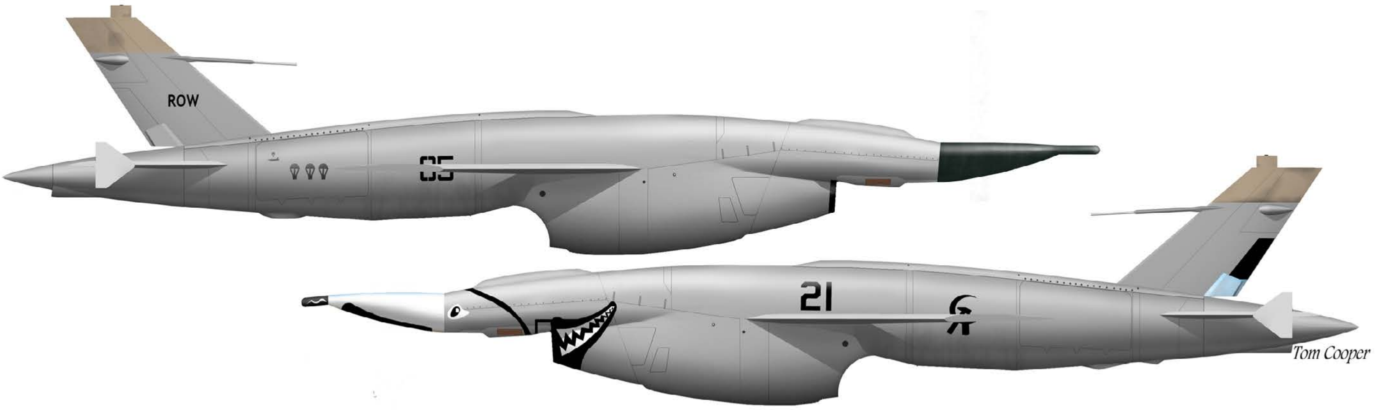
Before the Six-Day War the IDF mobile forces had relied principally on Air Force interceptors to prevent enemy air attacks. However, quick strikes had been occasionally successful, especially on forces arrayed along the Suez Canal front during the War of Attrition. Consequently, mobile defenses were created by placing the existing movable TCM-20 twin 20-mm system on captured Soviet BTR armored personnel carriers and the Second World War vintage American M3 halftrack that was widely used in many IDF roles. The TCM-20 was basically the American M55 from the war but upgraded and manufactured in Israel with the four M2 0.50-cal machine guns replaced with the Oerlikon cannon. Each weapon was fed from a 60-round drum with a nominal rate of fire of 150 rounds per minute. Traverse and elevation were both electric. The weapon was also used against ground targets during the Yom Kippur War. (Artwork by David Bocquelet)



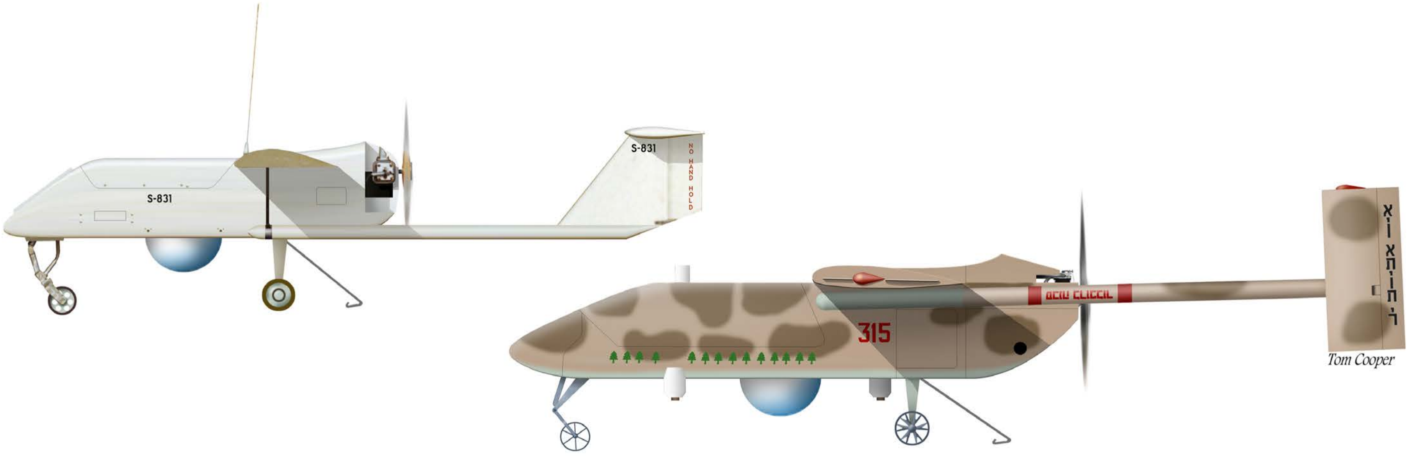
The Yom Kippur War showed that Israeli ground forces needed better air defenses given that the Air Force might be too occupied to provide effective support. Among several systems acquired to address the need was the American Chaparral. This possessed four infrared-guided MIM-72 missiles (an air-to-air AIM-9D Sidewinder) mounted on a tracked vehicle derived from the M-113 APC chassis. The gunner sat in a compartment between the missile rails and tracked targets optically. Eight reload rounds were carried. The principal drawback of the system was the short range of the missile and reaction time against fast, low-flying jets. The Chaparral served through 2003 and is credited with the only kill scored by the system, knocking down a Syrian MiG-17 in May 1974. (Artwork by David Bocquelet)



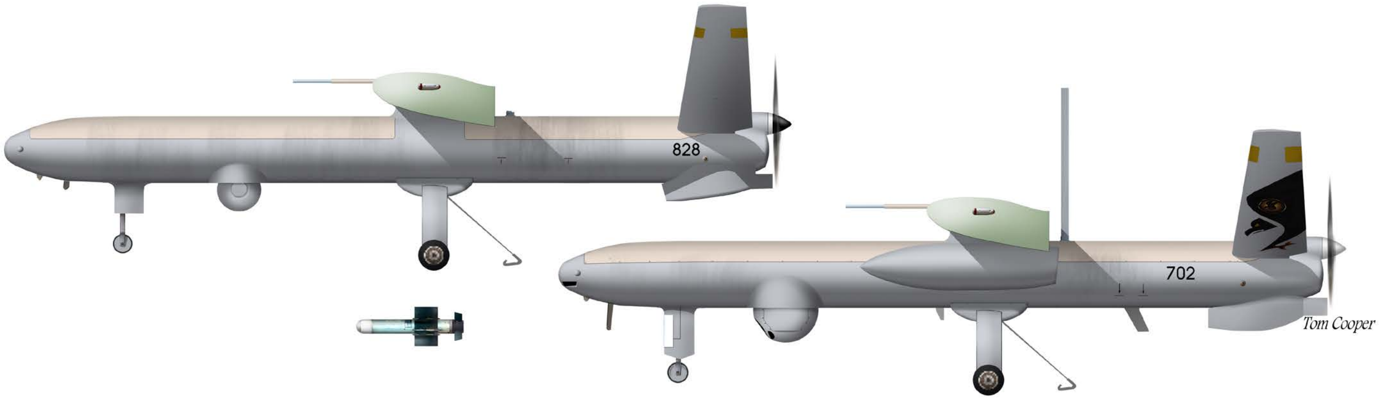
Israel had pursued several solutions to defeating short-range rockets and mortar bombs fired across the Lebanon and Gaza frontiers. The fielded system was named Iron Dome (*Kippat Barzel*), developed in Israel and manufactured by Rafael with partial funding from the United States. This employed an optically-guided missile to engage radar-tracked projectiles. The movable battery consisted of detection and tracking radar, the battle management and weapon control trailer, and three to four missile firing units (shown). The system discriminated targets on a trajectory for a populated area and engaged only those targets. Each firing unit had 20 Tamir missiles with an effective engagement range of 44 miles (70 km). Initially fielded in 2011, Iron Dome was very successful with many hundreds of incoming rounds intercepted to greatly reduce the threat. (Artwork by David Bocquelet)



Israel acquired the Ryan Firebee drone in 1971 to perform reconnaissance in areas of dense air defense systems. The 124I was a unique configuration and, like other Firebees, was recovered via midair snatch by helicopter. The 124Is were uniform medium gray except for dielectric panels, and they carried no squadron or national insignia. Shown is vehicle 21 from 1973 with unorthodox markings added by the operators, and 05 from 1990 with a vehicle name on the tail and mission markings on the panel aft of the stenciled number. Three digit numbers became common in the early 1990s until withdrawal in the mid-90s. (Artwork by Tom Cooper)

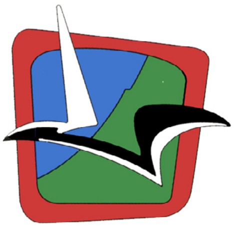


The Israelis pioneered large-scale operational employment of mini-Remotely Piloted Vehicles. The Mastiff Mk.2 (top) was used principally by Army Intelligence Corps through the early 1990s. Vehicle S-831 from 1989 is shown, the scarcity of markings meant to support (implausible) deniability if the aircraft went down in opposition territory – something that happened occasionally. The Scout RPV (bottom) was operated by the Air Force and went through several evolutions, including being renamed Searcher, until retirement in about 2005. Scout 315 is shown as it appeared in 1985 with Lebanese Cedar mission markings. These aircraft were either flown into nets or snagged an arresting cable on landing via the hooks shown beneath the fuselage. (Artwork by Tom Cooper)

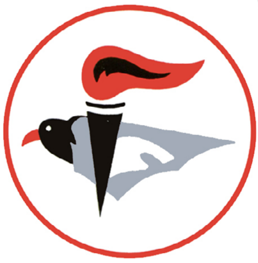


The Hermes 450S was a significant step up from the mini-RPVs to a semiautonomous Unmanned Air Vehicle. Introduced in 2003, it continued flying to date of writing through several variants. These revisions are seen in the difference in sensor domes between vehicles 828 and 702 from the mid-2000s. 828 displays the tail markings of 166 Squadron, based at Palmachim. Only the upper wing had a camouflage pattern. The Hermes 450S was still recovered by arrestment wire and often had the tall antenna above the mid-fuselage. Aircraft 702 carries a pod under each wing observed in May 2021 over the Gaza Strip. The Hermes 450S was known to be optionally armed, in later years with a small missile called Mikholit (shown) for anti-personnel and soft target engagement. (Artwork by Tom Cooper)

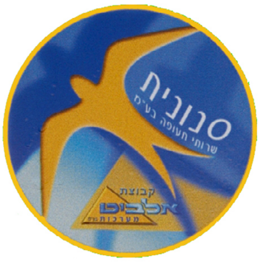
Unit Insignia, IDF/AF & IASF
1948-2020
(Part 3)



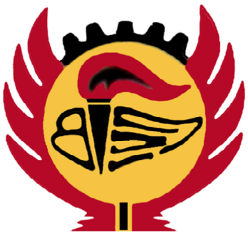
254 Squadron
Midland
(Mirage, Kfir)



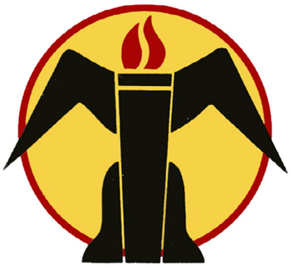
Flying School/Air Force Academy
(Cub, Magister, A-4 Skyhawk, Queen Air, Super King Air, Bell 206, Bell 212, JetRanger, Defender, AH-1 Cobra, T-6A, Grob 120)



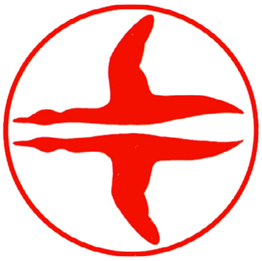
Flying School/ Air Force Academy
cadet screening flight (contractor)
(Grob 120)



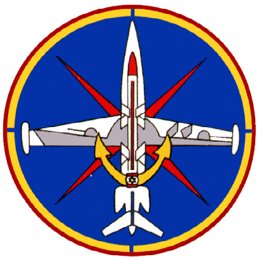
Helicopter Training Flight
123 Squadron
(Bell 205)



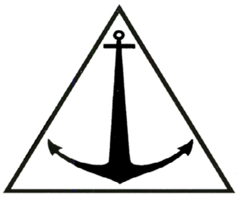
Advanced Training Squadron
(A-4 Skyhawk)



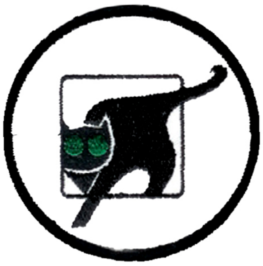
Aerobatic Team
Flying School/
Air Force Academy
(Magister, T-6A)



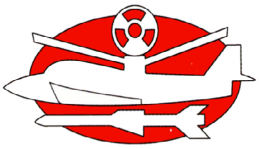
Maritime Flight
124 Squadron
(Sea Scan)



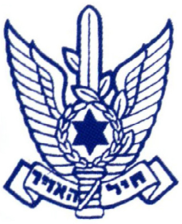
Maritime Helicopter Flight
124 Squadron
(HH-65 Dolphin)



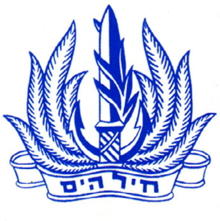
Unit 669
Aeromedical Evacuation
Unit (AEU)
(not displayed on aircraft)



Unit 601
Flight Test Center (MANAT)
(Magister, F-4, Kfir, Sea Stallion, F-15, F-16, MiG-23, MiG-29, F-35I)

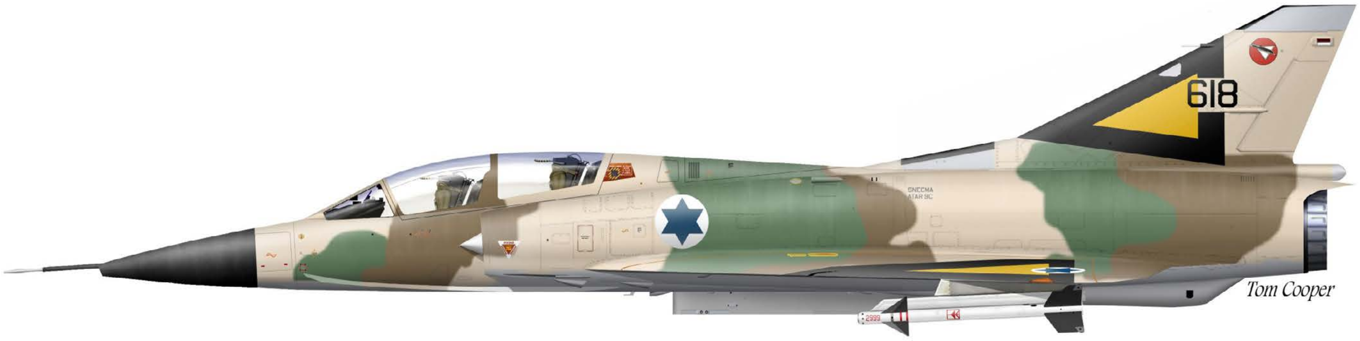


Israeli Air Force Seal
(Stratocruiser/Stratofreighter, Boeing 707, Super Frelon, Sea Scan, C-130)



Israeli Navy Seal
(SA.565 Panther)

Application of squadron insignia was not very common before the 1950s, and they were not universally applied until late in that decade. Many unit names and insignia evolved over time – usually as units transitioned between aircraft types. The review offered here shows the most frequently used insignia on types mentioned in the text: all are shown as oriented on the port side of the aircraft, where there was a unique orientation side-to-side.



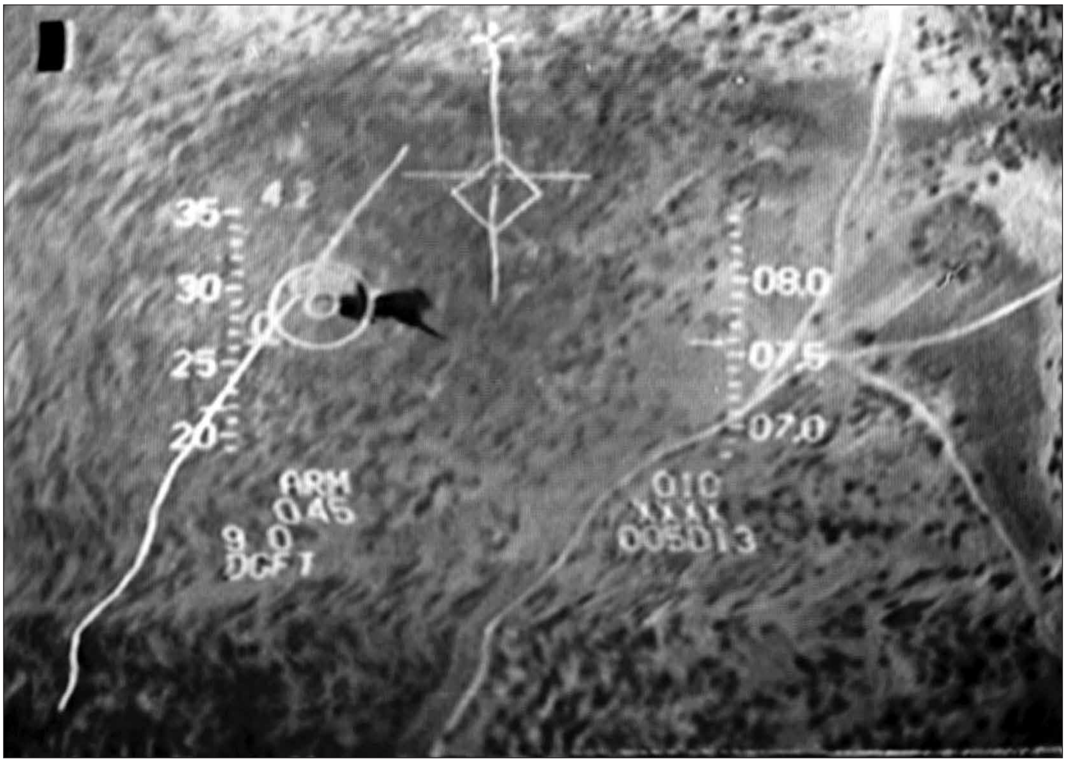
Prior to the Six-Day War, Israel had arranged to buy 50 Mirage 5Js designed to meet the specific IAF requirements. When France embargoed these airplanes following the war, Israel secretly arranged to build nearly identical Nesher airplanes from assembles shipped surreptitiously from France. The 51 Nesher S single-seat fighters, delivered from 1971 to 1975, were very important in supplementing the dwindling Mirage fleet. An additional ten dual-seat Nesher Ts, like that shown, were assembled in 1974. Even after the S was withdrawn for foreign sale, some Ts were retained because of their value as delta-wing trainers. Aircraft 618, circa 1975, wears the 253 squadron badge and the recognition triangles devised during the 1973 war for the delta-wing jets. (Artwork by Tom Cooper)

APPENDIX III: AIRCRAFT KILLS SUMMARY

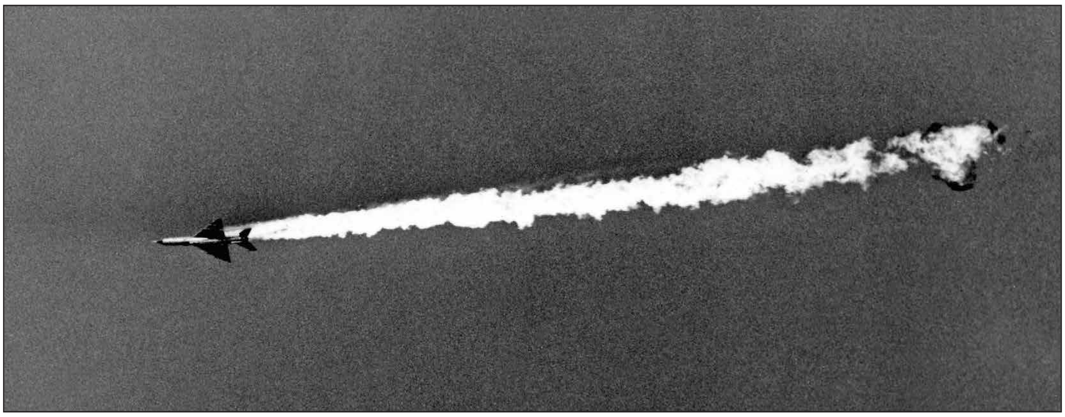
This table summarizes all the acknowledged enemy aircraft claimed destroyed in air combat and other IAF aviation action – a remarkable 700-plus.[1] Those in grey font are non-combat incidents. The key to the Target nationality is given immediately below. Under Weapon, "none" indicates an aircraft that maneuvered into the ground, exploded for unknown reason, or the pilot abandoned the machine before it was hit. These are awarded to the squadron but, in some cases, the aircraft and crew involved in the engagement are shown.Others were not officially accepted in the Air Force accounting. The aircraft number shown is not necessarily the tail number at the time of the event.

To say that there is controversy surrounding this topic would be an understatement. As researchers access archives and participants of opposition air arms, doubt grows about some of these claimed Israeli victories. This is far from isolated to the Arab-Israeli conflict, but there is an added complexion of suspected intentional bias. The past Israeli practice of concealment, obfuscation, and disinformation will forever cast doubt on some claims regardless of more recent research. The Israelis also scoff at Arab claims given their perception of poor record keeping and cultural tendency to treat history as a malleable reference suiting current narratives. They become angry at the proposition that the opposing nations' records are in any way comparable. Add to this the usual fog or war, records of various completeness or reliability, and simple unintentional errors, and one has to confess that no such summary can ever be accepted as entirely factual. However, this author knows many of the persons who have published the references drawn upon and seen some of the original records they have consulted. These include Air Force accounting (that has been reassessed and revised several times), squadron records of various kinds, debriefing records, logbooks, and communications with veteran pilots. I am convinced that these individuals are not part of a cabal seeking to exaggerate the combat record of the IDF. Yet, even these individuals debate amongst themselves over the details of each other's summaries. So, take it for what it is.

EAF = Egyptian Air Force
IrAF = Iraqi Air Force
LAF – Lebanon Air Force,
NK = North Korea
REAF = Royal Egyptian Air Force
RJAF = Royal Jordanian Air Force,
SAF = Syrian Arab Air Force
Sov = Union of Soviet Socialist Republics Red Air Force
UK = United Kingdom



Gun camera film from Israeli F-16A 107 of 117 Squadron, flown by Eytan Stibbe, shows the fighter engaging a Syrian Su-22 over Lebanon on June 11, 1982, with an AIM-9L missile. Such evidence was used to confirm kills, though some remained unconfirmed. Recent research, especially with Egyptian sources, suggest that more damaged aircraft recovered to base than initially suspected. (Ra'anan Weiss Collection)



Another MiG-21 goes down, as captured by a ground camera. (Ron Feldman Collection)

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
S-199	D-106	101	3.6.1948	Modi Alon	REAF C-47	Cannon
S-199	D-106	101	3.6.1948	Modi Alon	REAF C-47	Cannon
S-199	?	101	3.6.1948	Gideon Lichtman	REAF Spitfire	Cannon
S-199	D-107	101	10.7.1948	Maurice Mann	SAF Harvard	Cannon
S-199	?	101	18.7.1948	Modi Alon	REAF Spitfire	Cannon
S-199	D-119	101	23.9.1948	Gideon Lichtman	civilian Rapide	Cannon
S-199	D-121	101	16.10.1948	Rudy Augarten	REAF Spitfire	Cannon
Beaufighter	D-171	103 B	19.10.1948	Len Fichett / Dov Sugerman	REAF Fury	none
Spitfire	D-130	101	21.10.1948	Rudy Augarten	REAF Spitfire	Cannon
P-51	D-190	101	4.11.1948	Rudy Augarten	½ REAF C-47	Gun
P-51	D-191	101	4.11.1948	Boris Senior	½ REAF C-47	Gun
Spitfire	D-130	101	17.11.1948	Rudy Augarten	REAF Spitfire	Cannon
P-51	D-190	101	20.11.1948	Wayne Peake	UK Mosquito	Gun
Spitfire	D-130	101	22.12.1948	Rudy Augarten	REAF MC205V	Cannon
Spitfire	2001/10	101	28.12.1948	Gordon Levett	REAF Spitfire	Cannon
Spitfire	2001/10	101	28.12.1948	Gordon Levett	REAF MC205V	Cannon
Spitfire	2001/10	101	28.12.1948	John Doyle	REAF MC205V	Cannon
Spitfire	2004/14	101	30.12.1949	John Doyle	REAF MC205V	Cannon
Spitfire	2008/15	101	30.12.1948	John McElroy	REAF MC205V	Cannon
Spitfire	2008/15	101	31.12.1949	Clifford Wilson	REAF MC205V	Cannon
Spitfire	2003/12	101	5.1.1949	Seymour Feldman	REAF MC205V	Cannon
P-51	2301/40	101	5.1.1949	Boris Senior	REAF MC205V	Gun
P-51	2301/40	101	7.1.1949	Boris Senior	REAF Spitfire	Gun
P-51	2302/41	101	7.1.1949	John Doyle	REAF MC205V	Gun
Spitfire	2008/15	101	7.1.1949	John McElroy	UK Spitfire	Cannon
Spitfire	2008/15	101	7.1.1949	John McElroy	UK Spitfire	Cannon
Spitfire	2012/16	101	7.1.1949	Chalmers Goodlin	UK Spitfire	Cannon
Spitfire	2013/18	101	7.1.1949	William Schroeder	UK Tempest	Cannon
Meteor	?	117	?.7.1954	Aharon Yoeli (unofficial)	EAF Fury	none
Meteor FR.9	36	117	1.9.1955	Aharon Yoeli	EAF Vampire	Cannon
Meteor FR.9	36	117	1.9.1955	Aharon Yoeli	EAF Vampire	Cannon
Ouragan	28	113	12.4.1956	David Kishon	EAF Vampire	Cannon
Meteor NF.13	52	119	28.10.1956	Yoash Tsiddon / Elyashiv Brosh	EAF Il-14	Cannon
Mystère IVA	93	101	30.10.1956	Yosef Zuk	EAF MiG-15	Cannon
Mystère IVA	33	101	31.10.1956	Aharon Shavit	EAF Vampire	Cannon
Mystère IVA	33	101	31.10.1956	Aharon Shavit	EAF Vampire	Cannon
Mystère IVA	62	101	31.10.1956	Shai Egozi	EAF Vampire	Cannon
Mystère IVA	62	101	31.10.1956	Shai Egozi	EAF Vampire	Cannon
Mystère IVA	80	101	31.10.1956	Yaacov Nevo	EAF MiG-15	Cannon
Mystère IVA	85	101	31.10.1956	Yaacov Nevo	EAF MiG-17	Cannon
Mystère IVA	44	101	20.12.1958	Yaacov Nevo	EAF MiG-17	Cannon
SuperMystère	?	105	28.4.1961	Ilan Ron (unofficial)	EAF MiG-17	none
Mirage III	59	101	14.7.1966	Yoram Agmon	SAF MiG-21	Cannon
Mirage III	25	117	15.8.1966	Yehuda Koren	SAF MiG-21	Cannon
Mirage III	84	119	13.11.1966	Ran Ronen	RJAF Hunter	Cannon
Mirage III	34	101	29.11.1966	Michael Haber	EAF MiG-19	Cannon
Mirage III	34	101	29.11.1966	Michael Haber	EAF MiG-19	R.530
Mirage III	52	101	7.4.1967	Yiftach Spector	SAF MiG-21	Cannon
Mirage III	52	101	7.4.1967	Yiftach Spector	½ SAF MiG-21	Cannon
Mirage III	57	101	7.4.1967	Binyamin Romach	½ SAF MiG-21	Cannon
Mirage III	81	101	7.4.1967	Avner Slapak	SAF MiG-21	Cannon

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
Mirage III	02	117	7.4.1967	Ezra Dotan	SAF MiG-21	Cannon
Mirage III	60	117	7.4.1967	Abraham Lanir	SAF MiG-21	Cannon
Mirage III	32	119	7.4.1967	Ran Ronen	SAF MiG-21	Cannon
Ouragan	86	113	5.6.1967	David Yariv (disputed)	EAR MiG-17	Cannon
Mystère IVA	10	109	5.6.1967	Ami Gadish	EAF MiG-17	Cannon
Mystère IVA	44	109	5.6.1967	Assaf Ben-Nun	EAF MiG-17	Cannon
Mystère IVA	52	116	5.6.1967	Mario Shaked	RJAF Hunter	Cannon
SuperMystère	34	105	5.6.1967	Aharon Shavit	SAF MiG-21	Cannon
SuperMystère	40	105	5.6.1967	Amiran Manor (unofficial)	EAF Il-14	Cannon
SuperMystère	41	105	5.6.1967	Alexander Armon (unofficial)	EAF Il-14	Cannon
SuperMystère	65	105	5.6.1967	Yermiyahu Keidar	SAF MiG-21	Cannon
SuperMystère	65	105	5.6.1967	Yirmiyahu Keidar (unofficial)	EAF MiG-21	none
SuperMystère	73	105	5.6.1967	Haim Rotem (unofficial)	EAF MiG-17	Cannon
Mirage III	59	101	5.6.1967	Ilan Gonen	EAF Il-14	Cannon
Mirage III	77	101	5.6.1967	Dan Sever	EAF MiG-21	none
Mirage III	02	117	5.6.1967	Meir Shahar (unofficial ?)	SAF MiG-21	Cannon
Mirage III	42	117	5.6.1967	Ehud Henkin	SAF MiG-21	Cannon
Mirage III	45	117	5.6.1967	Uri Aven-Nir	LAF Hunter	Cannon
Mirage III	46	117	5.6.1967	Amnon Arad	SAF MiG-17	Cannon
Mirage III	46	117	5.6.1967	Amnon Arad	SAF MiG-17	Cannon
Mirage III	70	117	5.6.1967	Uri Gil	SAF MiG-21	Cannon
Mirage III	71	117	5.6.1967	Ezra Dotan	SAF MiG-21	Cannon
Mirage III	03	119	5.6.1967	Eitan Karmi	EAF MiG-21	Cannon
Mirage III	03	119	5.6.1967	Eitan Karmi	EAF MiG-21	Cannon
Mirage III	20	119	5.6.1967	Amon Levoshin	EAF MiG-19	Cannon
Mirage III	32	119	5.6.1967	Asher Snir	SAF MiG-21	Cannon
Mirage III	43	119	5.6.1967	Giora Rom	SAF MiG-21	Cannon
Mirage III	66	119	5.6.1967	Giora Rom	EAF MiG-21	Cannon
Mirage III	66	119	5.6.1967	Giora Rom	EAF MiG-21	Cannon
Mirage III	66	119	5.6.1967	Oded Sagi	RJAF Hunter	Cannon
Mirage III	78	119	5.6.1967	Ran Ronen	EAF MiG-19	Cannon
Mirage III	78	119	5.6.1967	Ran Ronen	EAF MiG-19	Cannon
Mirage III	?	119	5.6.1967	squadron	EAF MiG-19	none
Mirage III	06	101	6.6.1967	Baruch Friedman	EAF Su-7	Cannon
Mirage III	15	101	6.6.1967	Oded Marom	EAF MiG-19	Cannon
Mirage III	56	101	6.6.1967	Giora Epstein	EAF Su-7	Cannon
Mirage III	59	101	6.6.1967	Uri Shachar	EAF MiG-19	Cannon
Mirage III	73	101	6.6.1967	Yitzhak Barzilai	EAF Su-7	Cannon
Mirage III	77	101	6.6.1967	Avshalom Ran	EAF Su-7	Cannon
Mirage III	81	101	6.6.1967	Giora Furman	EAF MiG-21	Cannon
Mirage III	45	117	6.6.1967	Yehuda Koren	IrAF Hunter	Cannon
Mirage III	45	117	6.6.1967	Yehuda Koren	IrAF MiG-21	Cannon
Mirage III	?	117	6.6.1967	Amnon Arad	½ IrAF Tu-16	Shafrir
Mirage III	03	119	6.6.1967	Uri Yeari	EAF MiG-21	Cannon
Mirage III	03	119	6.6.1967	Oded Sagi	EAF Su-7	Cannon
Mirage III	20	119	6.6.1967	Omri Afek	EAF MiG-19	Cannon
Mirage III	66	119	6.6.1967	Oded Sagi	EAF MiG-19	Cannon
Vautour IIA	17	110	6.6.1967	Ben-Zion Zohar	IrAF Hunter	Cannon
Mirage III	09	101	7.6.1967	Amos Amir	EAF MiG-19	Cannon
Mirage III	34	101	7.6.1967	Yochai Richter	EAF MiG-19	Cannon
Mirage III	?	101	7.6.1967	squadron	EAF MiG-19	none

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
Mirage III	44	117	7.6.1967	Ezra Dotan	IrAF Hunter	Cannon
Mirage III	60	117	7.6.1967	Gideon Dror	IrAF Hunter	Cannon
Mirage III	?	117	7.6.1967	squadron	SAF MiG-21	Cannon
Mirage III	41	119	7.6.1967	Giora Rom	EAF MiG-17	Cannon
Mirage III	41	119	7.6.1967	Giora Rom	EAF MiG-17	Cannon
Mirage III	15	101	8.6.1967	Yosef Arazi	EAF MiG-21	Cannon
Mirage III	33	101	8.6.1967	Arlozor Lev	EAF MiG-17	Cannon
Mirage III	50	117	8.6.1967	Ehud Henkin	EAF MiG-17	unknown
Mirage III	58	119	8.6.1967	Reuven Rozen	EAF MiG-17	Cannon
Mirage III	68	119	8.6.1967	Abraham Salmon	EAF MiG-19	Cannon
Mirage III	68	119	8.6.1967	Abraham Salmon	EAF MiG-19	Cannon
Mirage III	78	119	8.6.1967	Menachem Shmul	EAF MiG-19	Cannon
Mirage III	78	119	8.6.1967	Menachem Shmul	EAF Il-28	Cannon
Mirage III	80	119	8.6.1967	Menachem Shmul	EAF MiG-21	Cannon
Mirage III	70	117	9.6.1967	Ehud Henkin	SAF MiG-21	unknown
Mirage III	78	119	9.6.1967	Asher Snir	EAF MiG-17	Cannon
Mirage III	78	119	9.6.1967	Asher Snir	EAF MiG-17	Cannon
Mirage III	41	119	8.7.1967	Avihu Ben-Nun	EAF MiG-21	Cannon
Mirage III	81	101	15.7.1967	Yoram Agmon	EAF Su-7	Cannon
Mirage III	68	119	15.7.1967	Eliezer Prigat	EAF MiG-21	Cannon
Mirage III	83	119	15.7.1967	Ran Ronen	EAF MiG-21	Shafrir
Mirage III	85	119	15.7.1967	Asher Snir	EAF MiG-17	Cannon
Mirage III	85	119	15.7.1967	Asher Snir	EAF MiG-17	Cannon
Mirage III	32	119	10.10.1967	Avihu Ben-Nun	EAF MiG-21	Cannon
Mirage III	81	101	10.12.1968	Oded Marom	EAF MiG-17	Cannon
Mirage III	54	117	12.2.1969	Uri Liss	SAF MiG-21	Shafrir 1
Mirage III	56	101	24.2.1969	Amnon Shamir	SAF MiG-21	Cannon
Mirage III	76	117	24.2.1969	Yaacov Richter	SAF MiG-17	Cannon
Mirage III	14	101	8.3.1969	Michael Zuk	EAF MiG-21	Cannon
Mirage III	68	119	14.4.1969	Reuven Rozen	EAF MiG-21	AIM-9B
Mirage III	03	119	21.5.1969	Ran Ronen	EAF MiG-21	Cannon
Mirage III	58	119	21.5.1969	Reuven Rozen	EAF MiG-21	Cannon
Mirage III	68	119	21.5.1969	Asher Snir	EAF MiG-21	Cannon
Mirage III	30	117	29.5.1969	Ithamar Neuner	SAF MiG-21	Sh 1 + Can
Mirage III	19	119	24.6.1969	Amos Amir	EAF MiG-21	Cannon
Mirage III	33	101	26.6.1969	Yiftach Spector	EAF MiG-21	Cannon
Mirage III	66	119	26.6.1969	Asher Snir	EAF MiG-21	AIM-9B
Mirage III	48	117	2.7.1969	Yaacov Richter	EAF MiG-21	Shafrir 2
Mirage III	58	119	2.7.1969	Eitan Karmi	EAF MiG-21	AIM-9B+C
Mirage III	58	119	2.7.1969	Eitan Karmi	EAF MiG-21	Cannon
Mirage III	68	119	2.7.1969	Amos Amir	EAF MiG-21	Cannon
Mirage III	07	101	7.7.1969	Avinoam Keldes	EAF MiG-21	none
Mirage III	159	101	7.7.1969	Oded Marom	EAF MiG-21	Cannon
Mirage III	33	101	8.7.1969	Eitan Ben-Eliyahu	SAF MiG-21	Cannon
Mirage III	56	101	8.7.1969	Giora Furman	SAF MiG-21	Cannon
Mirage III	56	101	8.7.1969	Giora Furman	SAF MiG-21	Cannon
Mirage III	29	117	8.7.1969	Yaacov Richter	SAF MiG-21	Cannon
Mirage III	31	117	8.7.1969	Uri Aven-Nir	SAF MiG-21	Shafrir 2
Mirage III	50	117	8.7.1969	Ran Goren	SAF MiG-21	Shafrir 2
Mirage III	62	117	8.7.1969	Shlomo Navot	SAF MiG-21	Shafrir 2
Mirage III	52	101	20.7.1969	Yiftach Spector	EAF MiG-21	Cannon

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
Mirage III	82	101	20.7.1969	Giora Epstein	EAF MiG-17	Cannon
Mirage III	159	101	20.7.1969	Giora Yoeli	EAF MiG-17	Cannon
Mirage III	07	101	24.7.1969	Michael Zur	EAF Su-7	Cannon
Mirage III	82	101	24.7.1969	Shamuel Gordon	EAF Su-7	Cannon
Mirage III	30	117	24.7.1969	Ran Goren	EAF Su-7	Cannon
Mirage III	50	117	24.7.1969	Shlomo Navot	EAF MiG-21	Shafrir 2
Mirage III	82	101	11.9.1969	Ilan Gonen	EAF Su-7	Cannon
Mirage III	159	101	11.9.1969	Giora Epstein	EAF Su-7	Cannon
Mirage III	30	117	11.9.1969	Shlomo Navot	EAF MiG-21	Cannon
Mirage III	50	117	11.9.1969	Yehuda Koren	EAF MiG-21	AIM-9B
Mirage III	70	117	11.9.1969	Avshalom Friedman	EAF MiG-21	Cannon
Mirage III	32	119	11.9.1969	Dror Harish	EAF MiG-21	Cannon
Mirage III	68	119	11.9.1969	Asher Snir	EAF MiG-21	Cannon
Mirage III	81	101	6.10.1969	Oded Marom	EAF MiG-21	Cannon
Mirage III	82	101	6.10.1969	Israel Baharav	EAF MiG-21	Cannon
Mirage III	82	101	6.10.1969	Israel Baharav	EAF MiG-21	Cannon
Mirage III	82	101	11.11.1969	Menachem Sharon	EAF MiG-21	Cannon
Mirage III	159	101	11.11.1969	Yair Sela	EAF MiG-21	Cannon
F-4E	08	201	11.11.1969	Ehud Henkin / Eyal Achikar	EAF MiG-21	AIM-9B
Mirage III	70	117	27.11.1969	Shlomo Navot	EAF MiG-21	Shafrir 2
Mirage III	76	117	11.12.1969	Uri Aven-Nir	SAF MiG-21	Shafrir 2
Mirage III	58	119	11.12.1969	Menachem Shmul	SAF MiG-17	Cannon
Mirage III	83	119	11.12.1969	Yitzhak Nir	SAF MiG-17	Cannon
Mirage III	159	101	4.1.1970	Oded Marom	EAF MiG-21	Cannon
Mirage III	64	117	4.1.1970	Ithamar Neuner	SAF MiG-21	Shafrir 2
Mirage III	31	117	8.1.1970	Ithamar Neuner	SAF MiG-21	Cannon
Mirage III	48	117	8.1.1970	Yaacov Richter	SAF MiG-21	Shafrir 2
Mirage III	76	117	8.1.1970	Shlomo Navot	SAF MiG-21	none
Mirage III	80	119	8.2.1970	Abraham Salmon	EAF MiG-21	Cannon
F-4E	126	69	8.2.1970	Aviem Sella / Shabtai Ben-Shoah	EAF MiG-21	Cannon
Mirage III	57	101	9.2.1970	Avinoam Keldes	EAF MiG-21	Cannon
Mirage III	32	119	26.2.1970	Abraham Gilad	EAF MiG-21	Cannon
Mirage III	58	119	26.2.1970	Amos Amir	EAF MiG-21	Cannon
Mirage III	83	119	26.2.1970	Abraham Salmon	EAF MiG-21	Cannon
Mirage III	159	101	6.3.1970	Yiftach Spector	EAF MiG-21	Cannon
F-4E	10	201	6.3.1970	Yitzhak Peer / David Yair	EAF MiG-21	Cannon
Mirage III	77	101	16.3.1970	Menachem Sharon	EAF MiG-21	none
Mirage III	15	101	25.3.1970	Oded Marom	EAF MiG-21	AIM-9B
Mirage III	77	101	25.3.1970	Giora Epstein	EAF MiG-21	Cannon
Mirage III	77	101	25.3.1970	Giora Epstein	EAF MiG-21	Cannon
Mirage III	81	101	25.3.1970	Israel Baharav	EAF MiG-21	Cannon
Mirage III	52	101	27.3.1970	Israel Baharav	EAF MiG-21	Cannon
Mirage III	52	101	27.3.1970	Israel Baharav	EAF MiG-21	AIM-9B
Mirage III	19	119	27.3.1970	Asher Snir	EAF MiG-21	Cannon
Mirage III	19	119	27.3.1970	Asher Snir	EAF MiG-21	Cannon
Mirage III	83	119	27.3.1970	Arnon Levoshin	EAF MiG-21	none
Mirage III	58	119	2.4.1970	Amos Amir	SAF MiG-21	AIM-9B
Mirage III	83	119	2.4.1970	Abraham Gilad	SAF MiG-21	none
Mirage III	68	119	2.4.1970	Abraham Gilad	SAF MiG-21	Cannon
F-4E	?	69	2.4.1970	Gideon Magen / Pini Nachmani (uno)	½ SAF MiG-21	unknown
Mirage III	58	119	25.4.1970	Amos Amir	EAF Il-28	AIM-9E

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
F-4E	?	201	25.4.1970	Shmuel Hetz / Menachem Eini	EAF Il-28	AIM-7E
Mirage III	79	119	28.4.1970	Yitzhak Nir	EAF Su-7	Cannon
Mirage III	83	119	28.4.1970	Dror Harish	EAF Su-7	AIM-9E
Mirage III	19	119	12.5.1970	Asher Snir	SAF MiG-17	AIM-9B
A-4H	03	109	12.5.1970	Ezra Dotan (over Lebanon)	SAF MiG-17	Cannon
A-4H	03	109	12.5.1970	Ezra Dotan (over Lebanon)	SAF MiG-17	Rockets
Mirage III	80	119	14.5.1970	Reuven Rozen	EAF MiG-21	AIM-9B
Mirage III	83	119	14.5.1970	Amos Amir	EAF MiG-21	Cannon
Mirage III	62	117	15.5.1970	Yaacov Richter	EAF MiG-17	AIM-9H
Mirage III	62	117	15.5.1970	Yaacov Richter	EAF MiG-17	AIM-9H
Mirage III	64	117	15.5.1970	Yehuda Koren	EAF MiG-21	Shafrir 2
Mirage III	68	119	16.5.1970	Abraham Salmon	EAF MiG-21	AIM-9E
Mirage III	85	119	16.5.1970	Omri Afek	EAF MiG-21	Cannon
Mirage III	53	117	3.6.1970	Ithamar Neuner	EAF MiG-21	Shafrir 2
Mirage III	19	119	3.6.1970	Ran Ronen	EAF MiG-21	Cannon
Mirage III	68	119	3.6.1970	Dror Harish	EAF MiG-21	Cannon
Mirage III	68	119	3.6.1970	Dror Harish	EAF MiG-21	none
F-4E	180	201	25.6.1970	Eitan Peled / Moshe Goldwasser	SAF MiG-21	AIM-9D
Mirage III	47	117	26.6.1970	Yehuda Koren	½ SAF MiG-17	Cannon
Mirage III	53	117	26.6.1970	Yehuda Koren	SAF MiG-21	Shafrir 2
Mirage III	64	117	26.6.1970	Amichai Rokeach	SAF MiG-17	Shafrir 2
Mirage IIIB	286	117	26.6.1970	Yaacov Richter	½ SAF MiG-17	Cannon
Mirage III	19	119	26.6.1970	Eliyahu Menachem	EAF Mi-8	Cannon
Mirage III	15	101	10.7.1970	Moshe Hertz	EAF MiG-21	Cannon
Mirage III	52	101	10.7.1970	Yiftach Spector	EAF MiG-21	Cannon
Mirage III	159	101	10.7.1970	Israel Baharav	EAF MiG-21	Cannon
Mirage III	159	101	10.7.1970	Israel Baharav	EAF MiG-21	AIM-9B
Mirage III	34	101	27.7.1970	Yiftach Spector	EAF MiG-17	Cannon
Mirage III	34	101	27.7.1970	Yiftach Spector	EAF MiG-17	AIM-9D
Mirage III	52	101	30.7.1970	Yiftach Spector	½ Sov MiG-21	AIM-9D
Mirage III	68	119	30.7.1970	Asher Snir	Sov MiG-21	AIM-9D
Mirage III	78	119	30.7.1970	Abraham Salmon	Sov MiG-21	AIM-9D
Mirage III	78	119	30.7.1970	Abraham Salmon	½ Sov MiG-21	AIM-9D
F-4E	105	69	30.7.1970	Avihu Ben-Nun / Shaul Levi	Sov MiG-21	AIM-7E
F-4E	183	69	30.7.1970	Aviem Sella / Reuven Reshef	Sov MiG-21	AIM-7E
F-4E	633	201	13.6.1972	Eitan Peled / Yoram Romem	EAF MiG-21	AIM-9D
F-4E	673	201	13.6.1972	Adi Benaya / Yosef Lev-Ari	EAF MiG-21	AIM-9D
Mirage III	44	101	9.9.1972	Ilan Auerbuch	SAF Su-7	AIM-9D
Mirage III	78	101	9.9.1972	Yoram Geva	SAF Su-7	AIM-9D
F-4E	183	69	9.9.1972	Avihu Ben-Nun / Zvi Edan (Kesler)	SAF Su-7	AIM-9D
Mirage III	51	101	9.11.1972	Ilan Gonen	SAF MiG-21	AIM-9D
Mirage III	78	101	9.11.1972	Abraham Lanir	SAF MiG-21	AIM-9D
Mirage III	29	117	21.11.1972	Yuval Neeman	SAF MiG-21	Shafrir 2
Mirage III	79	117	21.11.1972	Zvi Vered	SAF MiG-21	Shafrir 2
Mirage III	82	117	21.11.1972	Meir Ran	SAF MiG-21	Shafrir 2
F-4E	160	119	21.11.1972	Shmuel Ben-Rom / Aharon Katz	SAF MiG-21	AIM-9D
F-4E	643	201	21.11.1972	Amnon Gurion / Baruch Golan	SAF MiG-21	Cannon
F-4E	673	201	21.11.1972	Ithama Barnea / Yitzhak Baram	SAF MiG-21	AIM-9D
F-4E	115	107	2.1.1973	Shmuel Gordon / Yoni Harel	SAF MiG-21	none
Nesher	10	101	8.1.1973	Eliezer Yaari	SAF MiG-21	AIM-9D
Nesher	16	101	8.1.1973	Yoram Geva	SAF MiG-21	AIM-9D

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
F-4E	55	119	8.1.1973	Zvi Kanor / Zvi Tal	SAF MiG-21	AIM-9D
F-4E	147	119	8.1.1973	David Drori / Natan Peri	SAF MiG-21	AIM-9D
F-4E	147	119	8.1.1973	David Drori / Natan Peri	SAF MiG-21	none
F-4E (69 sqn)	160	119	8.1.1973	Shmulik Ben-Rom / Moti Ilani (119)	SAF MiG-21	AIM-9D
F-4E	640	201	12.1.1973	Amnon Gurion / Yitzhak Amitai	EAF MiG-21	none
F-4E	?	?	21.2.1973	unknown	Libyan 727	Cannon
Mirage III	78	101	13.9.1973	Israel Baharav	SAF MiG-21	Cannon
Mirage III	78	101	13.9.1973	Israel Baharav	SAF MiG-21	AIM-9D
Mirage III	259	101	13.9.1973	Abraham Salmon	SAF MiG-21	AIM-9D
Mirage III	79	117	13.9.1973	Amos Bar	SAF MiG-21	Shafrir 2
Mirage III	79	117	13.9.1973	Amos Bar	SAF MiG-21	Shafrir 2
F-4E	?	69	13.9.1973	Amnon Arad / Shaul Levi	SAF MiG-21	AIM-9D
F-4E	175	107	13.9.1973	Shlomo Egozy / Yossi Yavin	SAF MiG-21	Cannon
F-4E	184	107	13.9.1973	Yiftach Spector / Micha Oren	SAF MiG-21	AIM-9D
F-4E	184	107	13.9.1973	Yiftach Spector / Micha Oren	SAF MiG-21	AIM-9D
F-4E	125	119	13.9.1973	Moshe Melnik / Haim Barkan	SAF MiG-21	AIM-9D
F-4E	144	119	13.9.1973	Omri Afek / Haim Katz	SAF MiG-21	AIM-9D
F-4E	156	119	13.9.1973	Rafael Koren / Shimshon Rozen	SAF MiG-21	AIM-7
Nesher	03	144	6.10.1973	Menachem Shmul	EAF Su-7	Cannon
Nesher	15	144	6.10.1973	Assaf Ben-Nun	EAF Su-7	Shafrir 2
Nesher	66	144	6.10.1973	Yermiyahu Keidar	EAF Su-7	Cannon
Nesher	66	144	6.10.1973	Yermiyahu Keidar	EAF Su-7	Shafrir 2
Nesher	85	113	6.10.1973	Abraham Gilad	EAF Mi-8	Cannon
Nesher	85	113	6.10.1973	Abraham Gilad	EAF Mi-8	Cannon
Mirage III	259	101	6.10.1973	Eitan Karmi	EAF AS-5	Cannon
Mirage III	83	117	6.10.1973	Amos Bar	SAF MiG-21	Shafrir 2
F-4E	122	107	6.10.1973	Dani Shaki / David Regev	EAF MiG-17	AIM-9D
F-4E	122	107	6.10.1973	Dani Shaki / David Regev	EAF MiG-17	AIM-9D
F-4E	122	107	6.10.1973	Dani Shaki / David Regev	EAF MiG-21	AIM-9D
F-4E	130	107	6.10.1973	Dubi Yoffe / Koren Pereg	EAF Mi-8	Cannon
F-4E	151	107	6.10.1973	Shlomo Egozy / Roy Manoff	EAF Mi-8	Cannon
F-4E	151	107	6.10.1973	Shlomo Egozy / Roy Manoff	EAF Mi-8	Cannon
F-4E	151	107	6.10.1973	Shlomo Egozy / Roy Manoff	EAF Mi-8	Cannon
F-4E	151	107	6.10.1973	Shlomo Egozy / Roy Manoff	EAF Mi-8	jet wake
F-4E	151	107	6.10.1973	Shlomo Egozy / Roy Manoff	EAF Mi-8	jet wake
F-4E	181	107	6.10.1973	Amir Nachumi / Yossi Yavin	EAF MiG-17	AIM-9D
F-4E	181	107	6.10.1973	Amir Nachumi / Yossi Yavin	EAF MiG-17	AIM-9D
F-4E	181	107	6.10.1973	Amir Nachumi / Yossi Yavin	EAF MiG-17	AIM-9D
F-4E	181	107	6.10.1973	Amir Nachumi / Yossi Yavin	EAF MiG-17	AIM-9D
F-4E	?	107	6.10.1973	Ran Goren / Yossi Yaari	EAF Mi-8	Cannon
F-4E	141	119	6.10.1973	Moshe Melnik / Zvi Tal	EAF AS-5	AIM-7
F-4E	141	119	6.10.1973	Moshe Melinik / Zvi Tal	EAF Su-7	AIM-9D
F-4E	609	201	6.10.1973	Ben-Ami Peri / Yitzhak Amitai	EAF Mi-8	Cannon
F-4E	609	201	6.10.1973	Ben-Ami Peri / Yitzhak Amitai	EAF Mi-8	Cannon
F-4E	609	201	6.10.1973	Ben-Ami Peri / Yitzhak Amitai	EAF Mi-8	Cannon
F-4E	615	201	6.10.1973	Yonatan Ophir / Avikam Lif	EAF Mi-8	Cannon
F-4E	618	201	6.10.1973	Moshe Koren / Ilan Lazar	EAF Mi-8	Cannon
F-4E	671	201	6.10.1973	Eitan Peled / Abraham Asha'el	EAF Mi-8	Cannon
F-4E	671	201	6.10.1973	Eitan Peled / Abraham Asha'el	EAF Mi-8	Cannon
Nesher	93	113	7.10.1973	David Tavor	EAF MiG-21	Shafrir 2
Mirage III	785	101	7.10.1973	Eitan Karmi	EAF MiG-21	Shafrir 2

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Mirage III	07	117	7.10.1973	Zvi Vered	SAF MiG-21	Cannon
Mirage III	32	117	7.10.1973	Ami Lahav	SAF MiG-21	Shafrir 2
Mirage III	32	117	7.10.1973	Ami Lahav	SAF MiG-21	Shafrir 2
Mirage III	47	117	7.10.1973	Yuval Neeman	SAF MiG-21	Cannon
Mirage III	47	117	7.10.1973	Yuval Neeman	SAF MiG-21	Shafrir 2
Mirage III	64	117	7.10.1973	Daniel Schleider	SAF MiG-21	Cannon
Mirage III	66	117	7.10.1973	Yaacov Richter	SAF MiG-21	Cannon
Mirage III	79	117	7.10.1973	Avshalom Friedman	SAF MiG-21	Cannon
Mirage III	79	117	7.10.1973	Avshalom Friedman	SAF MiG-21	Shafrir 2
F-4E	102	69	7.10.1973	Zvulun Amitzi / Gur Israeli	EAF MiG-21	AIM-9D
F-4E	105	69	7.10.1973	Ze’ev Raz / Chaim Shahar	SAF MiG-21	Cannon
F-4E	169	69	7.10.1973	Yoel Feldsho / Meir Gur	EAF MiG-21	Cannon
F-4E	114	119	7.10.1973	Arnon Levoshin / Haim Katz	EAF MiG-21	Cannon
F-4E	159	119	7.10.1973	Rafael Koren / Moshe Bartov	EAF MiG-21	AIM-9D
Nesher	10	101	8.10.1973	Yehoshoa Sheffer	EAF MiG-21	AIM-9D
Nesher	17	101	8.10.1973	Dan Sever	EAF Su-7	Shafrir 2
Nesher	36	101	8.10.1973	Michael Katz	EAF Su-7	Shafrir 2
Nesher	65	101	8.10.1973	Michael Zuk	EAF Su-7	AIM-9D
Nesher	93	101	8.10.1973	Eitan Karmi	EAF MiG-21	Cannon
Nesher	93	101	8.10.1973	Eitan Karmi	EAF MiG-21	Shafrir 2
Nesher	?	101	8.10.1973	squadron	EAF Su-7	none
Nesher	09	113	8.10.1973	Ehud Ben-Amitai	EAF MiG-21	Shafrir 2
Nesher	02	144	8.10.1973	Yair Sella	SAF Su-20	Shafrir 2
Nesher	03	144	8.10.1973	Menachem Sharon	EAF MiG-21	Shafrir 2
Nesher	12	144	8.10.1973	Assaf Ben-Nun	EAF MiG-21	Cannon
Nesher	28	144	8.10.1973	Menachem Sharon	EAF MiG-17	Shafrir 2
Nesher	33	144	8.10.1973	Shimcha Kelman	EAF MiG-17	Shafrir 2
Nesher	33	144	8.10.1973	Shimcha Kelman	EAF MiG-17	Shafrir 2
Nesher	73	144	8.10.1973	Giora Goren (squadron ?)	SAF Su-20	Shafrir 2
Nesher	92	144	8.10.1973	Ariel Cohen	SAF Su-20	Shafrir 2
Nesher	?	144	8.10.1973	squadron	SAF Su-20	none
Mirage III	19	101	8.10.1973	Abraham Salmon (over Egypt)	IrAF Hunter	Shafrir 2
Mirage III	19	101	8.10.1973	Abraham Salmon (over Egypt)	IrAF Hunter	Sh 2 + Can
Mirage III	758	101	8.10.1973	Oded Marom	SAF MiG-17	Shafrir 2
Mirage III	785	101	8.10.1973	Oded Marom (over Egypt)	IrAF Hunter	Cannon
F-4E	110	107	8.10.1973	Yiftach Spector / Yonatan Erel (sqn)	SAF MiG-21	none
F-4E	172	107	8.10.1973	Yiftach Spector / Roy Manoff	SAF MiG-21	Cannon
F-4E	618	201	8.10.1973	Eitan Ben-Eliyahu / Palti’el Barak	EAF MiG-17	Cannon
F-4E	671	201	8.10.1973	Ron Holidai / Eran Cohen	EAF MiG-17	Cannon
F-4E	671	201	8.10.1973	Ron Holidai / Eran Cohen	EAF MiG-17	Cannon
F-4E	?	201	8.10.1973	Eli Zohar / Beni Kiryati (squadron)	EAF MiG-17	none
Mirage III	52	101	9.10.1973	Dror Harish	SAF MiG-17	Cannon
Mirage III	52	101	9.10.1973	Dror Harish	SAF MiG-17	Shafrir 2
Mirage III	03	117	9.10.1973	Hertzel Bodinger	SAF MiG-17	Cannon
Mirage III	14	117	9.10.1973	Daniel Schleider	SAF MiG-21	Sh 2 + Can
Mirage III	48	117	9.10.1973	Yochai Richter	SAF Su-20	Shafrir 2
Mirage III	53	117	9.10.1973	Uri Liss	SAF Su-7	Shafrir 2
Mirage III	79	117	9.10.1973	Zvi Vered	SAF Mi-8	Cannon
Mirage III	?	117	9.10.1973	Yochai Richter	SAF Mi-8	jet wake
Mirage III	?	117	9.10.1973	squadron	SAF Su-20	none
F-4E	142	119	9.10.1973	Omri Afek / Ze’ev Ze’evi	SAF MiG-19	AIM-7

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
Nesher	06	113	10.10.1973	Amos Shachar	EAF MiG-17	Cannon
?	?	113	10.10.1973	squadron	EAF Su-7	none
Mirage III	51	101	10.10.1973	Oded Marom	½ SAF Su-7	AIM-9D/G
Mirage III	?	101	10.10.1973	squadron	SAF Su-7	none
Mirage IIIB	86	113	10.10.1973	Ehud Ben-Amitai	EAF Su-7	Shafrir 2
Mirage III	07	117	10.10.1973	Yehuda Koren (over Syria)	EAF MiG-17	Shafrir 2
Mirage III	07	117	10.10.1973	Yuval Neeman	SAF Su-7	Shafrir 2
Mirage III	76	117	10.10.1973	Dror Avneri	SAF MiG-17	Shafrir 2
Mirage III	79	117	10.10.1973	Amos Bar	SAF MiG-17	Shafrir 2
Mirage III	83	117	10.10.1973	Uri Gil	SAF Su-7	Cannon
Mirage III	83	117	10.10.1973	Uri Gil	½ SAF Su-7	Shafrir 2
Mirage III	83	117	10.10.1973	Yaacov Richter	SAF MiG-21	Shafrir 2
Mirage III	?	117	10.10.1973	squadron (over Syria)	EAF MiG-17	none
F-4E	105	69	10.10.1973	Amnon Arad / Zvi Edan (Kesler)	SAF MiG-17	AIM-9D
F-4E	131	69	10.10.1973	Yitzhak Gat / Zvi Edan (Kesler)	SAF MiG-21	none
F-4E	210	107	10.10.1973	Yiftach Spector / Yonatan Erel	SAF MiG-21	none
F-4E	222	107	10.10.1973	Naftali Maimon / Oded Poleg	SAF MiG-21	AIM-9D
F-4E	?	119	10.10.1973	Moshe Melinik / Menachem Sagi	SAF MiG-21	none
Nesher	10	101	11.10.1973	Abraham Salmon	EAF MiG-21	Cannon
Nesher	31	101	11.10.1973	Ra’anan Ne’eman	EAF MiG-21	Shafrir 2
Nesher	01	113	11.10.1973	David Tavor	EAF MiG-21	Cannon
Nesher	?	113	11.10.1973	squadron	EAF Su-7	unknown
Mirage IIIB	86	113	11.10.1973	Ehud Ben Amitai	EAF Su-7	Shafrir 2
F-4E	110	107	11.10.1973	Shlomo Egozy / Yonatan Erel (sqn)	SAF MiG-21	none
F-4E	120	201	11.10.1973	Eitan Peled / Amiram Talmon	EAF MiG-21	Cannon
F-4E	120	201	11.10.1973	Eitan Peled / Amiram Talmon	EAF MiG-21	none
F-4E	?	201	11.10.1973	Eitan Ben-Eliyahu / Amiram Talmon	EAF MiG-21	none
F-4E	?	201	11.10.1973	squadron	EAF MiG-21	none
Nesher	21	113	12.10.1973	Shlomo Levy (over Syria)	IrAF Su-7	Cannon
Nesher	21	113	12.10.1973	Shlomo Levy (over Syria)	IrAF Su-7	Shafrir 2
Nesher	21	113	12.10.1973	Shlomo Levy (over Syria)	IrAF Su-7	Shafrir 2
Mirage III	58	101	12.10.1973	Avi Lanir	SAF MiG-17	AIM-9G
Mirage III	03	117	12.10.1973	Uri Gil	SAF MiG-21	Cannon
Mirage III	14	117	12.10.1973	Dan Sion	SAF Su-7	Shafrir 2
Mirage III	44	117	12.10.1973	Amos Bar	SAF MiG-21	Shafrir 2
Mirage III	48	117	12.10.1973	Elisha Peri (Fridman)	SAF MiG-21	Shafrir 2
Mirage III	50	117	12.10.1973	Uri Gil	SAF MiG-17	Shafrir 2
Mirage III	77	117	12.10.1973	Elisha Peri (Fridman)	SAF MiG-21	Shafrir 2
Mirage III	79	117	12.10.1973	Ithamar Neuner (over Syria)	IrAF Su-7	Shafrir 2
Mirage III	83	117	12.10.1973	Amichai Rokeach	SAF MiG-17	Shafrir 2
Mirage III	?	117	12.10.1973	squadron	SAF MiG-17	none
F-4E	111	69	12.10.1973	Yoram Agmon / Daniel Wittmann	SAF MiG-17	Cannon
F-4E	105	107	12.10.1973	Shlomo Egozy / Yonatan Erel (Syria)	IrAF MiG-21	none
F-4E	157	107	12.10.1973	Naftali Maimon / Yitzhak Raz (sqn)	SAF MiG-21	none
F-4E	616	201	12.10.1973	Gil Regev / Eitan Shmueli	SAF MiG-21	AIM-9D
Nesher	14	113	13.10.1973	Moshe Hertz	SAF MiG-21	Shafrir 2
Nesher	14	113	13.10.1973	Reuven Rozen	SAF Su-20	Sh 2+Can
Nesher	20	113	13.10.1973	Ra’anan Yosef	SAF MiG-17	Shafrir 2
Nesher	?	113	13.10.1973	squadron	SAF MiG-21	none
Mirage III	48	117	13.10.1973	Daniel Schleider	SAF MiG-17	Cannon
Mirage III	66	117	13.10.1973	Yehuda Koren	SAF MiG-17	AIM-9D

TYPE	NO.	SQN.	DATE	PILOT / NAVIGATOR	TARGET	WEAPON
Mirage III	71	117	13.10.1973	Yehuda Koren (over Syria)	IrAF Su-7	Shafrir 2
Mirage III	76	117	13.10.1973	Dan Sion	SAF MiG-21	Shafrir 2
Mirage III	76	117	13.10.1973	Dan Sion	SAF MiG-21	Shafrir 2
F-4E	109	69	13.10.1973	Yoram Agmon / Daniel Wittmann	SAF MiG-17	Cannon
F-4E	130	107	13.10.1973	Amir Nachumi / Ilan Ziv	IrAF MiG-21	AIM-9D
F-4E	?	119	13.10.1973	squadron	SAF MiG-21	none
F-4E	609	201	13.10.1973	Dani Haloutz / Shimon Noy	EAF MiG-21	AIM-9D
F-4E	693	201	13.10.1973	Gil Regev / Ilan Lazar	EAF Su-7	AIM-9D
F-4E	?	201	13.10.1973	squadron	SAF MiG-21	unknown
Nesher	24	144	14.10.1973	Menachem Sharon	EAF MiG-21	Cannon
Nesher	22	144	14.10.1973	Yosef Lavi	EAF MiG-21	Shafrir 2
Nesher	24	144	14.10.1973	Menachem Sharon	EAF MiG-21	Shafrir 2
Nesher	33	144	14.10.1973	Assaf Ben-Nun	EAF MiG-21	Cannon
F-4E	101	107	14.10.1973	Naftali Maimon / Yitzhak Raz	EAF MiG-21	Cannon
F-4E	101	107	14.10.1973	Naftali Maimon / Yitzhak Raz	EAF MiG-21	AIM-9D
F-4E	122	107	14.10.1973	Yiftach Spector / Roy Manoff	EAF MiG-21	AIM-9D
F-4E	130	107	14.10.1973	Shlomo Egozy / Yossi Yavin	SAF MiG-17	Cannon
F-4E	184	107	14.10.1973	Amir Nachumi / David Regev	EAF MiG-21	AIM-9D
F-4E	184	107	14.10.1973	Amir Nachumi / David Regev (sqn)	EAF MiG-21	none
F-4E	?	119	14.10.1973	Rafael Koren / Rachamim Sofer (sqn)	EAF MiG-21	none
F-4E	609	201	14.10.1973	Ben-Eliyahu / Talmon (sqn)	EAF MiG-21	none
F-4E	609	201	14.10.1973	Eitan Ben-Eliyahu / Amiram Talmon	EAF MiG-21	Cannon
F-4E	633	201	14.10.1973	Eitan Peled / Yehoar Gal	EAF MiG-21	Cannon
F-4E	186	107	15.10.1973	Yiftach Spector / Roy Manoff (sqn)	EAF MiG-21	none
F-4E	119	119	15.10.1973	Asher Snir / Aharon Katz	EAF MiG-21	Cannon
F-4E	616	201	15.10.1973	Ben-Ami Peri / Ilan Lazar	SAF MiG-21	AIM-9D
F-4E	?	201	15.10.1973	Gil Regev / Eitan Shmueli (squadron)	EAF MiG-21	none
Nesher	10	101	16.10.1973	Dan Sever	EAF MiG-21	Shafrir 2
Nesher	03	113	16.10.1973	Amit Eshchar	EAF MiG-21	AIM-9D
Nesher	09	113	16.10.1973	Ilan Gonen	EAF MiG-17	Shafrir 2
Nesher	14	113	16.10.1973	Shlomo Levy	EAF MiG-17	Cannon
Nesher	14	113	16.10.1973	Shlomo Levy	EAF MiG-17	Cannon
Nesher	65	113	16.10.1973	Amit Eshchar	EAF MiG-21	AIM-9D
Nesher	71	113	16.10.1973	Ya'acov Gal	EAF Su-7	Shafrir 2
Nesher	?	113	16.10.1973	squadron	EAF MiG-17	none
Nesher	?	113	16.10.1973	squadron	EAF MiG-17	none
Nesher	?	113	16.10.1973	squadron	EAF MiG-17	none
Nesher	?	113	16.10.1973	squadron	EAF MiG-17	none
Nesher	28	144	16.10.1973	Yermiyahu Keidar	EAF MiG-21	Shafrir 2
Nesher	68	144	16.10.1973	Ariel Cohen	EAF MiG-17	Shafrir 2
Nesher	92	144	16.10.1973	Amir Yahel	EAF MiG-17	Shafrir 2
Mirage III	51	101	16.10.1973	Yoram Geva	SAF MiG-17	AIM-9G
Mirage III	03	117	16.10.1973	Amos Bar (over Syria)	IrAF Su-7	Cannon
Mirage III	47	117	16.10.1973	Uri Liss	SAF Su-7	Shafrir 2
Mirage III	71	117	16.10.1973	Yehuda Koren	SAF MiG-17	AIM-9D
F-4E	109	69	16.10.1973	Yoram Agmon / Daniel Wittmann	SAF MiG-17	AIM-9D
F-4E	117	69	16.10.1973	Gideon Yahalom / Yoram Rubinstein	SAF MiG-21	Cannon
Nesher	18	113	17.10.1973	Ehud Ben-Amitai	SAF MiG-21	Shafrir 2
Nesher	20	113	17.10.1973	Eitan Aderes	EAF MiG-21	Shafrir 2
Nesher	71	113	17.10.1973	Amos Shachar	EAF MiG-21	Shafrir 2
Nesher	?	113	17.10.1973	squadron	EAF MiG-21	none

TYPE	**NO.**	**SQN.**	**DATE**	**PILOT / NAVIGATOR**	**TARGET**	**WEAPON**
Mirage III	52	101	17.10.1973	Gideon Livni	EAF MiG-21	Cannon
Mirage III	58	101	17.10.1973	Michael Zuk	EAF MiG-21	Cannon
Mirage III	03	117	17.10.1973	Uri Gil	SAF MiG-17	Shafrir 2
Mirage III	14	117	17.10.1973	Eliezer Adar	SAF MiG-21	Cannon
F-4E	165	119	17.10.1973	Asher Snir / Haim Katz	½ SAF MiG-21	AIM-9D
F-4E	147	119	17.10.1973	Moshe Melinik / Elazar Lior	½ SAF MiG-21	Cannon
F-4E	147	119	17.10.1973	Moshe Melinik / Elazar Lior	SAF MiG-21	AIM-9D
Nesher	09	101	18.10.1973	Gideon Livni	EAF MiG-17	Cannon
Nesher	09	101	18.10.1973	Gideon Livni	EAF MiG-21	Cannon
Nesher	09	101	18.10.1973	Gideon Livni	½ EAF MiG-21	Cannon
Nesher	65	101	18.10.1973	Dror Harish	EAF MiG-17	Cannon
Nesher	65	101	18.10.1973	Dror Harish	EAF MiG-21	Shafrir 2
Nesher	?	101	18.10.1973	squadron	EAF MiG-21	none
Nesher	10	113	18.10.1973	Ra’anan Yosef	EAF MiG-21	Shafrir 2
Nesher	11	113	18.10.1973	Gideon Dror	EAF MiG-17	Shafrir 2
Nesher	11	113	18.10.1973	Gideon Dror	EAF MiG-17	Shafrir 2
Nesher	18	113	18.10.1973	Shlomo Levy (Libyian aircraft)	EAF Mirage 5	Shafrir 2
Nesher	71	113	18.10.1973	Moshe Hertz	½ EAF MiG-21	Shafrir 2
Nesher	71	113	18.10.1973	Amit Eshchar (Libyian aircraft)	EAF Mirage 5	Shafrir 2
Nesher	?	113	18.10.1973	squadron (Libyian aircraft)	EAF Mirage 5	none
Mirage III	11	101	18.10.1973	Giora Epstein	EAF Mi-8	Cannon
Mirage IIIB	86	101	18.10.1973	Michael Zuk	EAF Su-7	Cannon
Nesher	09	101	19.10.1973	Gideon Livni	EAF Su-20	Cannon
Nesher	31	101	19.10.1973	Dror Harish	EAF MiG-21	Cannon
Nesher	61	101	19.10.1973	Giora Epstein	EAF Su-7	Cannon
Nesher	61	101	19.10.1973	Giora Epstein	EAF Su-7	Shafrir 2
Nesher	61	101	19.10.1973	Giora Epstein	EAF Su-20	Cannon
Nesher	61	101	19.10.1973	Giora Epstein	EAF Su-20	Shafrir 2
Nesher	?	101	19.10.1973	squadron	EAF MiG-17	none
Nesher	10	113	19.10.1973	Moshe Hertz	EAF MiG-21	Cannon
Nesher	10	113	19.10.1973	Ra’anan Yosef	EAF MiG-17	AIM-9D
Nesher	10	113	19.10.1973	Gideon Dror	EAF Su-20	Cannon
Nesher	61	113	19.10.1973	Moshe Hertz	EAF MiG-17	AIM-9D
Nesher	61	113	19.10.1973	Moshe Hertz	EAF MiG-17	AIM-9D
Nesher	24	144	19.10.1973	Menachem Eliyahu	EAF MiG-21	Shafrir 2
Nesher	24	144	19.10.1973	Menachem Eliyahu	EAF MiG-21	Shafrir 2
Nesher	73	144	19.10.1973	Ariel Cohen	EAF MiG-21	Cannon
Nesher	73	144	19.10.1973	Ariel Cohen	EAF MiG-21	Shafrir 2
Nesher	92	144	19.10.1973	Uri Aven-Nir	EAF MiG-21	Cannon
Nesher	92	144	19.10.1973	Uri Aven-Nir	EAF MiG-21	Shafrir 2
F-4E	159	69	19.10.1973	Yitzhak Gat / Yitzhak Katz	SAF MiG-21	AIM-9D
F-4E	622	201	19.10.1973	Roni Holidai / Yitzhak Amitai	EAF Su-7	AIM-9D
F-4E	685	201	19.10.1973	Eli Zohar / Beni Kiryati	EAF Su-7	AIM-9D
Nesher	61	101	20.10.1973	Giora Epstein	EAF MiG-21	Cannon
Nesher	61	101	20.10.1973	Giora Epstein	EAF MiG-21	Cannon
Nesher	61	101	20.10.1973	Giora Epstein	EAF MiG-21	Cannon
Nesher	61	101	20.10.1973	Giora Epstein	EAF MiG-21	Shafrir 2
Nesher	76	101	20.10.1973	Yoram Geva	EAF MiG-21	Cannon
Nesher	?	113	20.10.1973	Eitan Aderes	EAF MiG-21	AIM-9D
Nesher	07	144	20.10.1973	Yermiyahu Keidar	EAF MiG-21	Shafrir 2
Nesher	22	144	20.10.1973	Yosef Lavi	EAF MiG-21	Shafrir 2

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Nesher	26	144	20.10.1973	Amir Yahel	EAF MiG-21	Shafrir 2
Nesher	26	144	20.10.1973	Amir Yahel	EAF MiG-21	Shafrir 2
Nesher	33	144	20.10.1973	Menachem Eliyahu	EAF MiG-21	Shafrir 2
Nesher	34	144	20.10.1973	Assaf Ben-Nun	EAF MiG-21	Shafrir 2
Mirage IIIB	89	101	20.10.1973	Amiram Kalichman	EAF Su-7	AIM-9D
Nesher	76	101	21.10.1973	Yehoshoa Sheffer	EAF MiG-21	AIM-9D
Nesher	88	101	21.10.1973	Yoram Geva	EAF MiG-21	AIM-9D
Nesher	18	113	21.10.1973	Amos Shachar	EAF MiG-21	Cannon
Nesher	61	113	21.10.1973	Ya’acov Gal	EAF MiG-21	Shafrir 2
Nesher	71	113	21.10.1973	Moshe Hertz	EAF MiG-21	Shafrir 2
Nesher	85	113	21.10.1973	Shlomo Levy	EAF MiG-21	Shafrir 2
Nesher	85	113	21.10.1973	Shlomo Levy	EAF MiG-21	Shafrir 2
Nesher	03	144	21.10.1973	Yermiyahu Keidar	EAF MiG-21	Cannon
Nesher	03	144	21.10.1973	Yermiyahu Keidar	EAF MiG-21	Shafrir 2
Nesher	07	144	21.10.1973	Menachem Eliyahu	EAF MiG-21	Shafrir 2
Mirage III	30	117	21.10.1973	Uri Liss	SAF MiG-21	Shafrir 2
Mirage III	?	117	21.10.1973	squadron	SAF MiG-21	none
F-4E	149	119	21.10.1973	Nachom Merchavi / Mordechai Ilani	SAF MiG-21	AIM-9D
F-4E	163	119	21.10.1973	Dani Guri / Zvi Binyamini	SAF MiG-21	Cannon
F-4E	?	201	21.10.1973	Eitan Peled / Yehoar Gal (squadron)	SAF MiG-21	none
F-4E	?	201	21.10.1973	Eitan Peled / Yehoar Gal (squadron)	SAF MiG-21	none
Nesher	10	101	22.10.1973	Michael Zuk	EAF L-29	AIM-9D
Nesher	09	113	22.10.1973	Shlomo Levy	SAF MiG-21	Cannon
Nesher	09	113	22.10.1973	Shlomo Levy	SAF MiG-21	Shafrir 2
Nesher	18	113	22.10.1973	Moshe Shavit	EAF MiG-21	Shafrir 2
Nesher	90	144	22.10.1973	Uri Aven-Nir (Libyian aircraft)	EAF Mirage 5	Shafrir 2
Nesher	?	144	22.10.1973	squadron	EAF L-29	none
Mirage III	51	101	22.10.1973	Eitan Karmi	SAF MiG-21	Cannon
Mirage III	47	117	22.10.1973	Daniel Schleider	SAF MiG-21	Shafrir 2
Mirage III	50	117	22.10.1973	Yaacov Richter	SAF MiG-21	Cannon
Nesher	65	101	23.10.1973	Michael Haber	½ EAF MiG-21	AIM-9D
Nesher	11	113	23.10.1973	Ilan Gonen	EAF MiG-21	Cannon
Nesher	18	113	23.10.1973	Gideon Dror	EAF MiG-21	Cannon
Nesher	61	113	23.10.1973	Abraham Gilad	EAF MiG-21	Cannon
Nesher	?	113	23.10.1973	Amos Shachar	½ EAF MiG-21	AIM-9D
Nesher	08	144	23.10.1973	Ariel Cohen	EAF MiG-17	Shafrir 2
Nesher	26	144	23.10.1973	Michael Avrahami	EAF MiG-21	Cannon
Nesher	26	144	23.10.1973	Michael Avrahami	EAF MiG-21	Cannon
Nesher	92	144	23.10.1973	Giora Goren	EAF MiG-17	Shafrir 2
Mirage III	33	101	23.10.1973	Amiram Kalichman	SAF MiG-21	AIM-9D
Mirage III	33	101	23.10.1973	Amiram Kalichman	SAF MiG-21	AIM-9D
Mirage III	52	101	23.10.1973	Israel Baharav	SAF MiG-21	Cannon
Mirage III	79	117	23.10.1973	Yaacov Richter	SAF MiG-21	AIM-9D
Mirage III	?	117	23.10.1973	squadron	SAF MiG-21	none
F-4E	153	107	23.10.1973	David Gal / David Regev	EAF MiG-21	AIM-9D
F-4E	162	119	23.10.1973	Moshe Melinik / Haim Katz	EAF MiG-21	AIM-9D
F-4E	165	119	23.10.1973	Gideon Sheffer / David Benkir	EAF MiG-21	AIM-9D
F-4E	609	201	23.10.1973	Dani Haloutz / Yehoar Gal	SAF MiG-21	AIM-7
F-4E	609	201	23.10.1973	Dani Haloutz / Yehoar Gal	SAF MiG-21	AIM-9D
F-4E	671	201	23.10.1973	Roni Holidai / Yoram Romem (sqn)	SAF MiG-21	AIM-9D
F-4E	678	201	23.10.1973	Yigal Stavi / Eitan Shmueli	SAF MiG-21	AIM-9D

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Nesher	11	101	24.10.1973	Eliezer Yeari	½ EAF MiG-21	Shafrir 2
Nesher	25	101	24.10.1973	Israel Baharav	EAF MiG-21	Cannon
Nesher	25	101	24.10.1973	Israel Baharav	EAF MiG-21	Cannon
Nesher	65	113	24.10.1973	Ilan Gonen	EAF MiG-21	Cannon
Nesher	65	113	24.10.1973	Ilan Gonen	EAF MiG-21	Shafrir 2
Nesher	?	113	24.10.1973	Amit Eshchar	½ EAF MiG-21	Shafrir 2
Nesher	34	144	24.10.1973	Shlomo Erez	EAF MiG-21	Cannon
Mirage III	33	101	24.10.1973	Abraham Salmon	EAF MiG-21	Cannon
Mirage III	51	101	24.10.1973	Dan Sever	½ EAF MiG-21	Cannon
Mirage IIIB	86	101	24.10.1973	Giora Epstein	EAF MiG-21	Cannon
Mirage IIIB	86	101	24.10.1973	Giora Epstein	EAF MiG-21	Cannon
Mirage IIIB	86	101	24.10.1973	Giora Epstein	EAF MiG-21	AIM-9D
Mirage IIIB	89	101	24.10.1973	Michael Zuk	EAF MiG-21	Cannon
F-4E	207	69	6.12.1973	Danny Segev (Shpitzer) / Ofer Uri	½ NK MiG-21	unknown
F-4E	311	69	6.12.1973	Yiftach Shadmi / Meir Gur (Syria)	½ NK MiG-21	AIM-9D
F-4E	144	119	6.12.1973	Aharon Sagi / Haim Katz	EAF MiG-21	AIM-9D
Mirage III	58	101	19.4.1974	Abraham Salmon	SAF MiG-21	Cannon
Mirage III	58	101	19.4.1974	Abraham Salmon	SAF MiG-21	AIM-9D
Nesher	65	101	29.4.1974	Herzl Bodinger	SAF MiG-21	AIM-9J
Nesher	578	101	29.4.1974	Gideon Livni	SAF MiG-21	Cannon
F-4E	310	69	29.4.1974	Zeev Raz / Avraham Baruch	SAF MiG-21	AAM
F-4E	318	69	29.4.1974	Yoram Agmon / Meir Gur	SAF MiG-21	AAM
Kfir C2	874	101	27.6.1979	Shai Echel	SAF MiG-21	Python 3
F-15A	663	133	27.6.1979	Moshe Melnik	SAF MiG-21	Python 3
F-15A	672	133	27.6.1979	Yoram Peled	SAF MiG-21	AIM-9J
F-15A	689	133	27.6.1979	Eitan Ben Eliyahu	SAF MiG-21	Cannon
F-15B	704	133	27.6.1979	Yoel Feldschuh (Pladsho)	SAF MiG-21	AIM-7F
F-15A	676	133	24.9.1979	Dadi Rosenthal	SAF MiG-21	AIM-7F
F-15A	692	133	24.9.1979	Israel Shafir	SAF MiG-21	AIM-9G
F-15A	695	133	24.9.1979	Avner Naveh	SAF MiG-21	Cannon
F-15A	695	133	24.9.1979	Avner Naveh	SAF MiG-21	Python 3
F-15A	696	133	24.8.1980	Ilan Margalit	SAF MiG-21	AIM-7F
F-15A	695	133	31.12.1980	Yoav Stern	SAF MiG-21	Python 3
F-15A	646	133	31.12.1980	Yair Rachmilevich	SAF MiG-21	AIM-9G
F-4E	?	119	31.12.1980	Ran Granot / Zvi Erlich	SAF MiG-21	Python 3
F-15A	672	133	13.2.1981	Benjamin Zin (Zinker)	SAF MiG-25P	AIM-7F
F-16A	112	117	28.4.1981	Rafi Berkovich	SAF Mi-8	Cannon
F-16A	126	117	28.4.1981	Dubi Yoffe	SAF Mi-8	AIM-9
Firebee drone	?	200	14.5.1981	squadron	SAF MiG-21	none
F-16A	219	110	14.7.1981	Amir Nachumi	SAF MiG-21	AIM-9L
F-15A	673	133	29.7.1981	Saul Simon	SAF MiG-25P	AIM-7F
RF-4E	491	119	3.1.1982	Ran Granot / Daniel Grossmann	½ IrAF MiG-21	none
RF-4E	498	119	3.1.1982	Gideon Sheffer / Yuval Naveh	½ IrAF MiG-21	none
F-16A	107	117	21.4.1982	Ze'ev Raz	SAF MiG-23	AIM-9L
F-16A	284	117	21.4.1982	Hagai Katz	SAF MiG-23	AIM-9L
F-16A	240	110	25.5.1982	Amos Mohar	SAF MiG-21	AIM-9L
F-16A	240	110	25.5.1982	Amos Mohar	SAF MiG-21	AIM-9L
F-15A	658	133	7.6.1982	Ofer Lapidot	SAF MiG-23	Python 3
F-15A	686	133	8.6.1982	Yoram Hofman	SAF MiG-21	AIM-7F
F-15C	818	133	8.6.1982	Saul Simon	½ SAF MiG-23	AIM-7F
F-15C	832	133	8.6.1982	Dadi Rosenthal	½ SAF MiG-23	AIM-7F

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F-15D	957	133	8.6.1982	Saul Schwartz / Reuven Solan	SAF MiG-21	AIM-7F
F-16A	225	110	8.6.1982	Shlomo Sas	SAF MiG-23	AIM-9L
F-16A	242	110	8.6.1982	Dubi Ofer	SAF MiG-23	AIM-9L
F-16A	250	110	8.6.1982	Avishai Cana'an	SAF MiG-23	AIM-9L
F-15A	646	133	9.6.1982	Avi Maor	SAF MiG-21	Cannon
F-15A	646	133	9.6.1982	Avi Maor	SAF MiG-23	Python 3
F-15A	658	133	9.6.1982	Gil Rapaport	SAF MiG-23	AIM-7F
F-15A	684	133	9.6.1982	Ronen Shapira	SAF MiG-23	AIM-7F
F-15A	684	133	9.6.1982	Yoram Peled	SAF MiG-21	Python 3
F-15A	686	133	9.6.1982	Ronen Shapira	SAF MiG-21	Python 3
F-15A	695	133	9.6.1982	Oran Hempel	SAF MiG-21	AIM-7F
F-15C	802	133	9.6.1982	Moshe Melnik	SAF MiG-23	AIM-7F
F-15C	802	133	9.6.1982	Moshe Melnik	SAF MiG-21	Python 3
F-15A	?	133	9.6.1982	squadron	SAF MiG-23	none
F-15A	?	133	9.6.1982	squadron	SAF MiG-23	none
F-16A	220	110	9.6.1982	Amir Nachumi	SAF MiG-21	AIM-9L
F-16A	223	110	9.6.1982	Israel Shafir	SAF MiG-21	AIM-9L
F-16A	232	110	9.6.1982	Israel Shafir	SAF MiG-21	AIM-9L
F-16A	237	110	9.6.1982	Ofer Einav	SAF MiG-21	AIM-9L
F-16A	243	110	9.6.1982	Avishai Cana'an	SAF MiG-21	AIM-9L
F-16A	250	110	9.6.1982	Roee Tamir	SAF MiG-21	AIM-9L
F-16A	255	110	9.6.1982	Avi Lavi	SAF MiG-21	AIM-9L
F-16A	107	117	9.6.1982	Eliezer Shkedi	SAF MiG-23	AIM-9L
F-16A	107	117	9.6.1982	Eliezer Shkedi	½ SAF MiG-23	AIM-9L
F-16A	129	117	9.6.1982	Eytan Stibbe	½ SAF MiG-23	AIM-9L
F-16A	267	253	9.6.1982	Nimrod Gur	SAF MiG-23	AIM-9L
F-16A	272	253	9.6.1982	Moshe Rozenfeld	SAF MiG-21	AIM-9L
F-16A	272	253	9.6.1982	Moshe Rozenfeld	½ SAF MiG-23	AIM-9L
F-16A	287	253	9.6.1982	Arnon Sharabi	½ SAF MiG-23	AIM-9L
F-16A	290	253	9.6.1982	Uri Gil	SAF MiG-21	Cannon
F-16A	290	253	9.6.1982	Uri Gil	SAF MiG-23	AIM-9L
F-15A	667	133	10.6.1982	Yftach Shadmi	SAF MiG-21	Python 3
F-15B	708	133	10.6.1982	Saul Schwartz / Uzi Shapira	SAF MiG-21	Python 3
F-15C	802	133	10.6.1982	Noam Canaani	SAF MiG-23	Python 3
F-15C	802	133	10.6.1982	Noam Canaani	SAF MiG-23	Python 3
F-15C	828	133	10.6.1982	Gil Rapaport	SAF MiG-23	Python 3
F-15C	840	133	10.6.1982	Benjamin Zin (Zinker)	SAF MiG-23	Python 3
F-15C	848	133	10.6.1982	Yoram Hofman	SAF MiG-21	Cannon
F-15C	848	133	10.6.1982	Ziv Nadivi	SAF Gazelle	Python 3
F-15D	955	133	10.6.1982	Micki Lev	SAF MiG-21	Python 3
F-15D	957	133	10.6.1982	Avner Naveh / Michael Cohen	SAF MiG-23	AIM-7F
F-15D	957	133	10.6.1982	Avner Naveh / Michael Cohen	SAF MiG-21	Python 3
F-15D	957	133	10.6.1982	Avner Naveh / Michael Cohen	SAF MiG-23	Python 3
F-15D	979	133	10.6.1982	Yoram Peled / Zvi Liphschitz	SAF MiG-21	Python 3
F-16A	234	110	10.6.1982	Amir Nachumi	SAF MiG-21	AIM-9L
F-16A	234	110	10.6.1982	Amir Nachumi	SAF MiG-23	AIM-9L
F-16A	234	110	10.6.1982	Amir Nachumi	SAF MiG-23	none
F-16A	111	117	10.6.1982	Itzhak Levin	SAF MiG-21	AIM-9L
F-16A	111	117	10.6.1982	Itzhak Levin	SAF Gazelle	AIM-9L
F-16A	116	117	10.6.1982	Rafi Berkovich	SAF MiG-23	AIM-9L
F-16A	116	117	10.6.1982	Rafi Berkovich	SAF MiG-23	AIM-9L

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F-16A	116	117	10.6.1982	Rafi Berkovich	SAF MiG-21	Cannon
F-16A	118	117	10.6.1982	Hagai Katz	SAF MiG-23	AIM-9L
F-16A	124	117	10.6.1982	Shlomo Zaytman	SAF MiG-23	AIM-9L
F-16A	138	117	10.6.1982	Ami Lustig	SAF MiG-23	Cannon
F-15A	678	133	11.6.1982	Yoram Peled	SAF MiG-23	AIM-7F
F-15A	678	133	11.6.1982	Yoram Peled	SAF MiG-23	AIM-7F
F-15C	840	133	11.6.1982	Yftach Shadmi	SAF MiG-21	Python 3
F-15B	704	133	11.6.1982	Saul Schwartz / Amir Chodorov	SAF MiG-21	Python 3
F-15A	646	133	11.6.1982	Ofer Lapidot	SAF MiG-21	Python 3
F-16A	225	110	11.6.1982	Israel Shafir	SAF Su-22	AIM-9L
F-16A	225	110	11.6.1982	Israel Shafir	SAF Su-22	AIM-9P3
F-16A	237	110	11.6.1982	Amir Nachumi	SAF MiG-23	AIM-9L
F-16A	237	110	11.6.1982	Amir Nachumi	SAF MiG-23	AIM-9L
F-16A	240	110	11.6.1982	Yehuda Bavli	SAF Su-22	AIM-9L
F-16A	246	110	11.6.1982	Roee Tamir	SAF MiG-21	AIM-9L
F-16A	107	117	11.6.1982	Eytan Stibbe	SAF Su-22	Cannon
F-16A	107	117	11.6.1982	Eytan Stibbe	SAF Su-22	AIM-9L
F-16A	107	117	11.6.1982	Eytan Stibbe	SAF MiG-23	AIM-9L
F-16A	107	117	11.6.1982	Eytan Stibbe	SAF Gazelle	AIM-9P3
F-16A	252	117	11.6.1982	Amos Bar	SAF Su-22	Cannon
F-16A	254	117	11.6.1982	Dani Oshrat	SAF MiG-21	AIM-9L
F-16A	254	117	11.6.1982	Dani Oshrat	SAF Su-22	none
F-16A	258	117	11.6.1982	Rani Falk	SAF MiG-21	Cannon
F-16A	258	117	11.6.1982	Rani Falk	SAF Su-22	AIM-9L
F-4E	238	105	11.6.1982	Ben-Ami Peri / David Oakman	SAF MiG-21	Python 3
F-15D	979	106	24.6.1982	Yoel Feldschuh / Zvika Liphshitz	SAF MiG-23	Python 3
F-15D	979	106	24.6.1982	Yoel Feldschuh / Zvika Liphshitz	SAF MiG-23	Python 3
F-15C	821	106	31.8.1982	Saul Schwartz	½ SAF MiG-25R	AIM-7F
F-16A	112	117	13.6.1985	Itzhak Gat	SAF DR-3 UAV	Cannon
F-15C	840	106	19.11.1985	Avner Naveh	SAF MiG-23	Python 3
F-15C	840	106	19.11.1985	Avner Naveh	½ SAF MiG-23	Python 3
F-15D	957	106	19.11.1985	Yuval Ben-Zur / Ofer Paz	½ SAF MiG-23	Python 3
AH-64	?	113	1997	unknown	IAI Heron UAV	Hellfire
AH-64	967	113	14.5.2001	unknown	civilian C-152	Hellfire
unknown	?	?	2001	unknown	Drone	unknown
unknown	?	?	?	unknown	Drone	unknown
F-16C	364	110	7.8.2006	Ofer	Ababil UAV	Python 4
F-16D	074	109	13.8.2006	unknown	Ababil UAV	Python 4
F-16I	844	201	6.10.2012	unknown	Ababil UAV	Python 5
F-16C	340	117	25.4.2013	unknown	Ababil UAV	Python 5
F-16	?	?	4.10.2016	unknown	UAV	unknown
F-16C	519	101	23.2.2017	unknown	Hamas UAV	unknown
AH-64D	789	113	10.2.2018	L.	Saeghe UAV	Hellfire
F-15I	?	69	29.10.2019	unknown	Hamas UAV	unknown

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Further References

A comprehensive list of references collected by the author over 50 years of researching the Israeli Air Force would span more than the length of this book. Space has precluded the inclusion of more than those sources directly related to each of the volumes in this mini-series. For a fuller list of the materials consulted by the author, please visit the downloads section of www.helion.co.uk

About the Author

William J. Norton is retired from a flight test engineering career that spanned 40 years, including 20 years as a US Air Force officer. This included serving as aircrew aboard test aircraft. He has held numerous positions in many organizations on dozens of aerospace programs spanning all aircraft types. He has penned scores of technical papers, seventeen books, and a multitude of magazine articles. Bill holds a Masters in Aeronautical Engineering and has taught technical courses at the college-level. In addition, he is a civil pilot with numerous ratings, restored and operates a DHC-1 Chipmunk, and built a Rutan Long-EZ. Bill is married to the lovely Anya Victoria. This is his third volume for Helion's Middle East @War series.

Cover photo: AH-64D

The American Apache attack helicopter was long sought before finally being acquired in 1990 after which it remained a vital Air Force asset. Later the more capable AH-64D Apache Longbow was desired, but the cost delayed initial introduction to 2005 and limited to just 17 aircraft. Helicopter 719 of 113 Squadron at Ramon AB is seen a decade into service and featuring the fire control radar fairing atop the rotor mast, Israeli SATCOM antenna domes on the stub wings, extended range external fuel tanks, dummy Hellfire rounds, and multiple self-defense systems antennas. (Ofer Zidon Collection)

Cover artwork: F-35I

The IASF pursued acquisition of the stealthy F-35 from early in the development of the warplane. It was a rocky road to the order for 50 machines, the conventional takeoff and landing version selected, and they finally began arriving in 2016. The F-35I was another step up in cost and complexity, plus reversing decades if Israeli devotion to dual-seat warplanes. Two units operated the airplanes from Nevatim. The requirement to maintain low-visibility markings drove adoption of alternates to the national roundel and the usual tail badges, as shown by F-35I aircraft 932 from 2019 with 116 Squadron markings (tail and inlet). The IASF had plans of further expanding the Lightning II fleet. (Artwork by Tom Cooper)

Rear Cover

Prior to the Six-Day War Israel had arranged to buy 50 Mirage 5Js designed to meet the specific IAF requirements. When France embargoed these airplanes following the war, Israel secretly arranged to build nearly identical Nesher airplanes from assembles shipped surreptitiously from France. The 51 Nesher S single-seat fighters, delivered from 1971 to 1975, were very important in supplementing the dwindling Mirage fleet. An additional ten dual-seat Nesher Ts, like that shown, were assembled in 1974. Even after the S was withdrawn for foreign sale, some Ts were retained because of their value as delta-wing trainers. Aircraft 618, circa 1975, wears the 253 squadron badge and the recognition triangles devised during the 1973 war for the delta-wing jets. (Artwork by Tom Cooper)